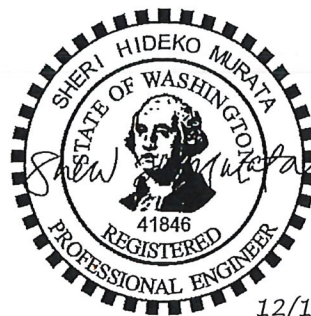


**PRELIMINARY**  
**TECHNICAL INFORMATION REPORT**  
**FOR**  
**MALLARD BAY**

CITY OF ISSAQUAH IN KING COUNTY, WASHINGTON



12/16/16

Project Manager: Jim Olsen, P.E.  
Prepared by: Sheri Murata, P.E.  
First Submittal: December 16 2016  
Revised:  
Core No.: 16066



14711 NE 29th Place, Suite 101  
Bellevue, Washington 98007  
Ph 425.885.7877  
[www.coredesigninc.com](http://www.coredesigninc.com)



# Mallard Bay

## Table of Contents

1 PROJECT OVERVIEW .....	1
Figure 1-1: Vicinity Map .....	2
2 CONDITIONS AND REQUIREMENTS SUMMARY .....	3
2.1 Core Requirements .....	3
2.1.1 Core Requirement #1: Discharge at the Natural Location.....	3
2.1.2 Core Requirement #2: Offsite Analysis .....	3
2.1.3 Core Requirement #3: Flow Control .....	3
2.1.4 Core Requirement #4: Conveyance System .....	3
2.1.5 Core Requirements #5: Erosion and Sediment Control.....	3
2.1.6 Core Requirement #6: Maintenance and Operations .....	3
2.1.7 Core Requirement #7: Financial Guarantees and Liability .....	3
2.1.8 Core Requirement #8: Water Quality .....	3
2.2 Special Requirement #1: Other Adopted Area-Specific Requirements .....	3
2.2.1 Critical Drainage Areas.....	3
2.2.2 Master Drainage Plan .....	3
2.2.3 Basin Plans .....	4
2.2.4 Salmon Conservation Plans (SCPs).....	4
2.2.5 Stormwater Compliance Plans (SWCPs) .....	4
2.2.6 Lake Management Plans (LMPs).....	4
2.2.7 Flood Hazard Reduction Plan Updates (FHRPs).....	4
2.2.8 Shared Facility Drainage Plans (SFDPs).....	4
2.3 Special Requirement #2: Floodplain / Floodway Delineation.....	4
2.4 Special Requirement #3: Flood Protection Facilities .....	4
2.5 Special Requirement #4: Source Controls.....	4
2.6 Special Requirement #5: Oil Control.....	4
3 OFFSITE ANALYSIS.....	5
TASK 1 Study Area Definition and Maps .....	5
TASK 2 Resource Review .....	5

TASK 3 Field Investigation .....	6
Figure 3-1: Downstream Drainage Exhibit.....	8
TASK 4 Drainage System Description and Problem Description .....	9
TASK 5 Mitigation of Existing and Potential Problems.....	9
Figure 3-2: Current Water Quality Conditions (Fecal Coliform Bacteria Levels).....	10
Figure 3-3: Current Water Quality Conditions (Dissolved Oxygen Levels).....	11
Figure 3-4: Current Water Quality Conditions (Temperature Levels) .....	12
Figure 3-5: Current Water Quality Conditions (pH Levels).....	13
4 FLOW CONTROL AND WATER QUALITY DESIGN .....	17
4.1 Existing Site Hydrology.....	17
4.2 Developed Site Hydrology.....	18
4.3 Performance Standards.....	19
Figure 4-1: Existing Conditions Basin Exhibit.....	21
4.4 Flow Control System .....	23
Figure 4-2: Developed Conditions Exhibit .....	25
4.5 Water Quality Calculations .....	29
5 CONVEYANCE SYSTEM ANALYSIS AND DESIGN .....	31
6 SPECIAL REPORTS AND STUDIES.....	33
7 OTHER PERMITS.....	35
8 ESC ANALYSIS AND DESIGN .....	37
9 BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT .....	39
9.1 Bond Quantities .....	39
9.2 Facility Summaries .....	39
9.3 Declaration of Covenant .....	39
10 OPERATIONS AND MAINTENANCE .....	41



## **Appendix A – Parcel & Basin Information**

King County Parcel Report

Figure 2-2 Stormwater Drainage Sub-basins in Issaquah

## **Appendix B – Resource Review & Off-site Analysis Documentation**

Critical Aquifer Recharge Area Classification Map

FEMA Map (53033C069H)

USDA NRCS Site Soils Report

Drainage Complaints Exhibit

## **Appendix C – Vault Sizing**

West Vault Summary

West Peaks Performance Plot

West Durations Performance Plot

East Vault Summary

East Peaks Performance Plot

East Durations Performance Plot



## 1 PROJECT OVERVIEW

The project site is located at 21403 SE 43<sup>rd</sup> Way in the City of Issaquah, King County. Specifically, the project is in the southwest quarter of the northwest quarter of Section 16, Township 24 North, Range 6 East, W.M. The site is bordered by a parcel owned by Sammamish Plateau Water to the north, Lake Sammamish State Park to the east, East Lake Sammamish Parkway to the south and SE 43<sup>rd</sup> Way to the west. The King County tax parcel ID number is shown in Table 1 below (refer to the King County Parcel Reports included in Appendix A).

Table 1: Parcel Information		
KC Parcel #	Parcel Area (SF)	Parcel Area (ac)
1624069007	566,400	13.0

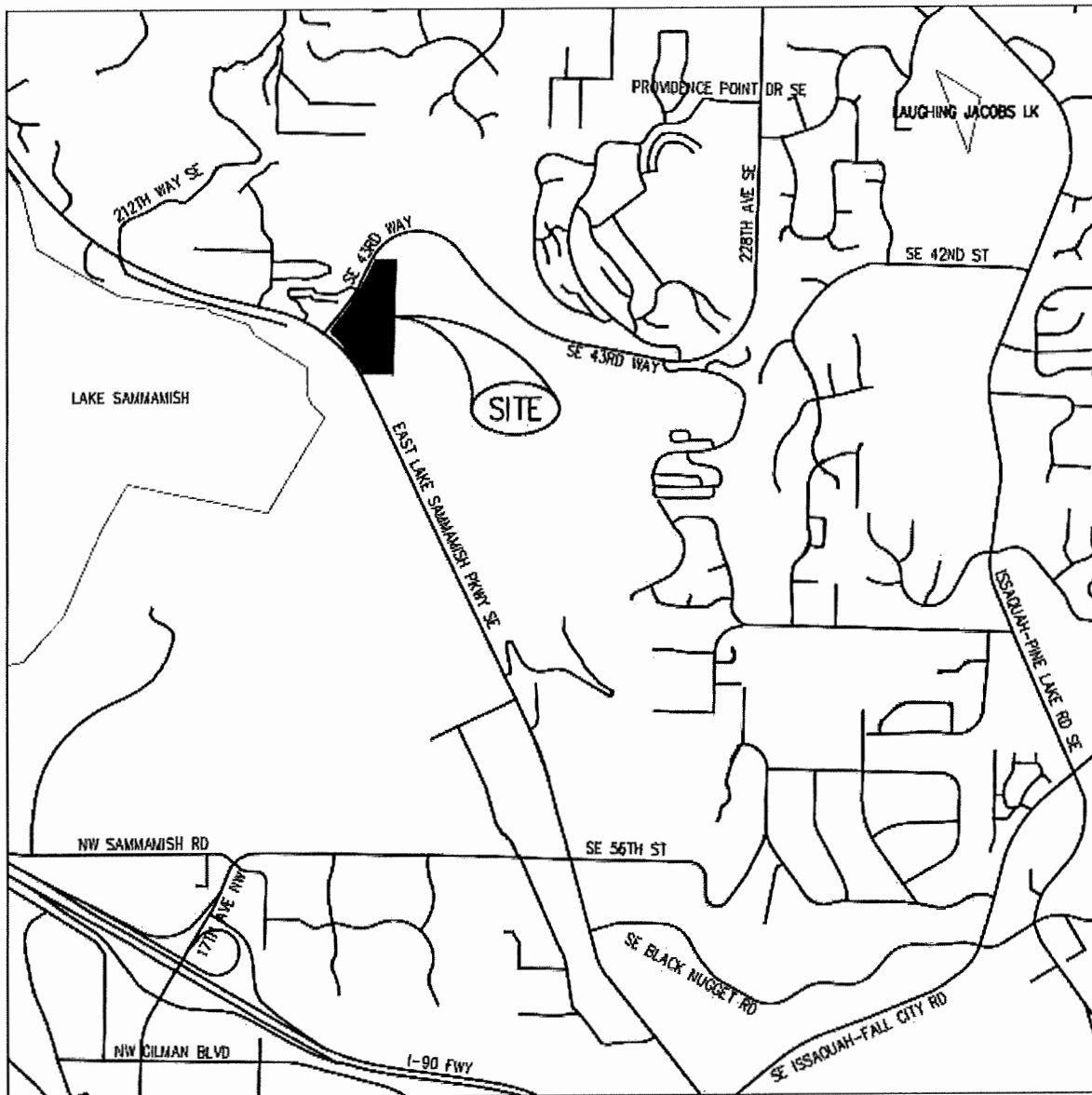
\*Parcel Area is per the Boundary and Topographic survey completed not IMap

The total parcel area is approximately 13.0 acres in size and completely forested. The project area drains south and west down steep slopes (slopes 40% or greater) to creek running parallel to SE 43<sup>rd</sup> Way and then southeast into Wetland A in the south portion of the site, which discharges to Lake Sammamish under East Lake Sammamish Parkway. There is no upstream area draining to the project.

The proposed development includes 34 lots, two detention vaults, two Modular Wetland Systems and the associated roads and utilities. Tract A and B is the critical area tract for this project. See *Figure 1-1: Vicinity Map*, provided below.

The project will be designed using the guidelines and requirements established in the 2009 King County Surface Water Design Manual (2009 KCSWDM) and City of Issaquah Addendum criteria. The project will be adding more than 5,000 square feet of new impervious area so it is required to apply Conservation Flow Control (Level 2) and Sensitive Lake Water Quality.

The detention vaults were modeled using the King County Runoff Time Series (KCRTS) software.



*Figure 1-1: Vicinity Map*

## **2 CONDITIONS AND REQUIREMENTS SUMMARY**

The proposed project is classified as requiring "Full Drainage Review" per the 2009 KCSWDM. Therefore, all eight core requirements and five special requirements will be addressed per Section 1.1 of the 2009 KCSWDM).

### **2.1 Core Requirements**

#### **2.1.1 Core Requirement #1: Discharge at the Natural Location**

This project will match the natural discharge point to Wetland A in the south portion of the parcel.

#### **2.1.2 Core Requirement #2: Offsite Analysis**

This core requirement is addressed in Section 3 of this report.

#### **2.1.3 Core Requirement #3: Flow Control**

The detention vault is designed for Conservation Flow Control (Level 2). This requires that the developed condition discharge durations match the existing condition durations from 50% of the 2-year to the 50-year storm events and that the developed 2-year and 10-year peak discharge rates do not exceed the existing 2-year and 10-year peak discharge rates, respectively.

#### **2.1.4 Core Requirement #4: Conveyance System**

A backwater analysis using King County Backwater (KCBW) will be provided with the Site Work Permit to show that the proposed conveyance system provides sufficient capacity for the 25-year storm as calculated by the Rational Method.

#### **2.1.5 Core Requirements #5: Erosion and Sediment Control**

Erosion and sediment control design will be provided during the Site Work Permit.

#### **2.1.6 Core Requirement #6: Maintenance and Operations**

The detention vaults and Modular Wetland Systems will be privately maintained.

#### **2.1.7 Core Requirement #7: Financial Guarantees and Liability**

A bond quantities worksheet will be provided in Section 9 of this Report upon the second submittal of the Site Work Permit.

#### **2.1.8 Core Requirement #8: Water Quality**

Sensitive Lake water quality treatment will be provided by two Modular Wetland Systems.

### **2.2 Special Requirement #1: Other Adopted Area-Specific Requirements**

#### **2.2.1 Critical Drainage Areas**

Per the City's Critical Aquifer Recharge Areas map (included in Appendix B) the south portion of the site is in a Class 3 High Aquifer Recharge Area.

#### **2.2.2 Master Drainage Plan**

Not applicable.

### **2.2.3 Basin Plans**

This project is located within the Providence Point sub-basin which drains to Lake Sammamish.

### **2.2.4 Salmon Conservation Plans (SCPs)**

Not applicable.

### **2.2.5 Stormwater Compliance Plans (SWCPs)**

Not applicable.

### **2.2.6 Lake Management Plans (LMPs)**

Not applicable.

### **2.2.7 Flood Hazard Reduction Plan Updates (FHRPs)**

This project is not within a floodplain (see FIRM map included in Appendix B) and is not within an area with an applicable Flood Hazard Reduction Plan. Therefore, additional requirements from a Flood Hazard Reduction Plan do not apply.

### **2.2.8 Shared Facility Drainage Plans (SFDPs)**

Not applicable.

## **2.3 Special Requirement #2: Floodplain / Floodway Delineation**

This project is not located within the 100-year floodplain (see FEMA Map included in Appendix B).

## **2.4 Special Requirement #3: Flood Protection Facilities**

This project is not located within a 100-year floodplain so there are no levees, revetments or berms within the project.

## **2.5 Special Requirement #4: Source Controls**

This project does not require a commercial building or commercial site development permit so source controls do not apply.

## **2.6 Special Requirement #5: Oil Control**

This project is not considered a high use site so oil control does not apply.

### **3 OFFSITE ANALYSIS**

#### **TASK 1 Study Area Definition and Maps**

The proposed project contains parcel number 1624069007.

#### **TASK 2 Resource Review**

##### **Basin Reconnaissance Summary Reports**

No Basin Reconnaissance Summary Reports appear to be available for the area that is within one mile of this project site.

##### **FEMA Maps**

A FEMA map dated May 16, 1995 number 53033C0685 F was reviewed. The site is not located within a floodplain as it is covered by "Zone X – Outside of 500-year floodplain. The FEMA Map is included in Appendix B.

##### **Sensitive Areas Folio**

The project site has steep slopes, a creek and wetlands on site.

##### **USDA Natural Resources Conservation Service Soil Survey**

The USDA Natural Resources Conservation Service (NRCS) Web Soil Survey covers the project site area and states that the area of interest comprises of mainly of Kitsap Silt Loam, with smaller areas of Everett very gravelly sandy loam and mixed alluvial sand. The Soils Map exhibit is included in Appendix B.

##### **Downstream Drainage Complaints**

Drainage complaints were researched within the study area. King County lists three complaints located within a one-mile radius downstream of the project site. Two of the complaints (1986-0112, 2015-0477) were on the project site, but one was closed in 1986. The other complaint was a water quality complaint closed on 11/8/15 with no additional comments.

The last complaint was complaint number 2004-0853 on the Lake Sammamish State Park which indicated the following: *E-mail regarding alert from SalmonWatcher. Orange/yellow color on streambed of Laughing Jacobs Creek at Lake Sammamish. Investigation shows substance is apparently naturally occurring.* This complaint was closed on 11/15/04.

There are no current documented downstream problems associated with this project site. See *Drainage Complaint Exhibit* in Appendix B.

## **TASK 3 Field Investigation**

### **Upstream Tributary Area**

There is no upstream drainage to this project.

### **Level 1 Downstream Analysis**

The field investigation was completed on November 25, 2016. The weather was cloudy and the temperature was approximately 50 degrees. See Downstream Drainage Exhibit at the end of this section.

Runoff on site currently sheet flows to a small onsite stream that generally flows to the south. The stream is approximately 2 feet wide and 1 foot deep. As the stream reaches the southern boundary of the project site it turns and heads southwest towards East Lake Sammamish Parkway SE. This stream parallels Laughing Jacobs Creek after it turns to the southwest and then passes under East Lake Sammamish Parkway SE through a large concrete box culvert, approximately 4 feet wide and 3 feet tall (Point A). After the stream passes through the box culvert, it flows into Laughing Jacobs Creek on the southwest side of East Lake Sammamish Parkway SE (Point B). Laughing Jacobs Creek is a well-established stream, about 7 feet wide and 2 feet deep, which continues to flow southwest. Approximately 750 feet after passing under East Lake Sammamish Parkway, Laughing Jacobs Creek discharges into Lake Sammamish (Point C).

In summary, no signs of erosion or significant sedimentation were noted. The downstream system appears, in general, to be stable.

The following pages show photos of the downstream path. See Figure 3-1 Downstream Drainage Exhibit on the following page for location of photos and location of points referenced in the report.





1 – Looking east at stream on site.



2 – Looking north at the box culvert on the southwest side of East Lake Sammamish Parkway SE

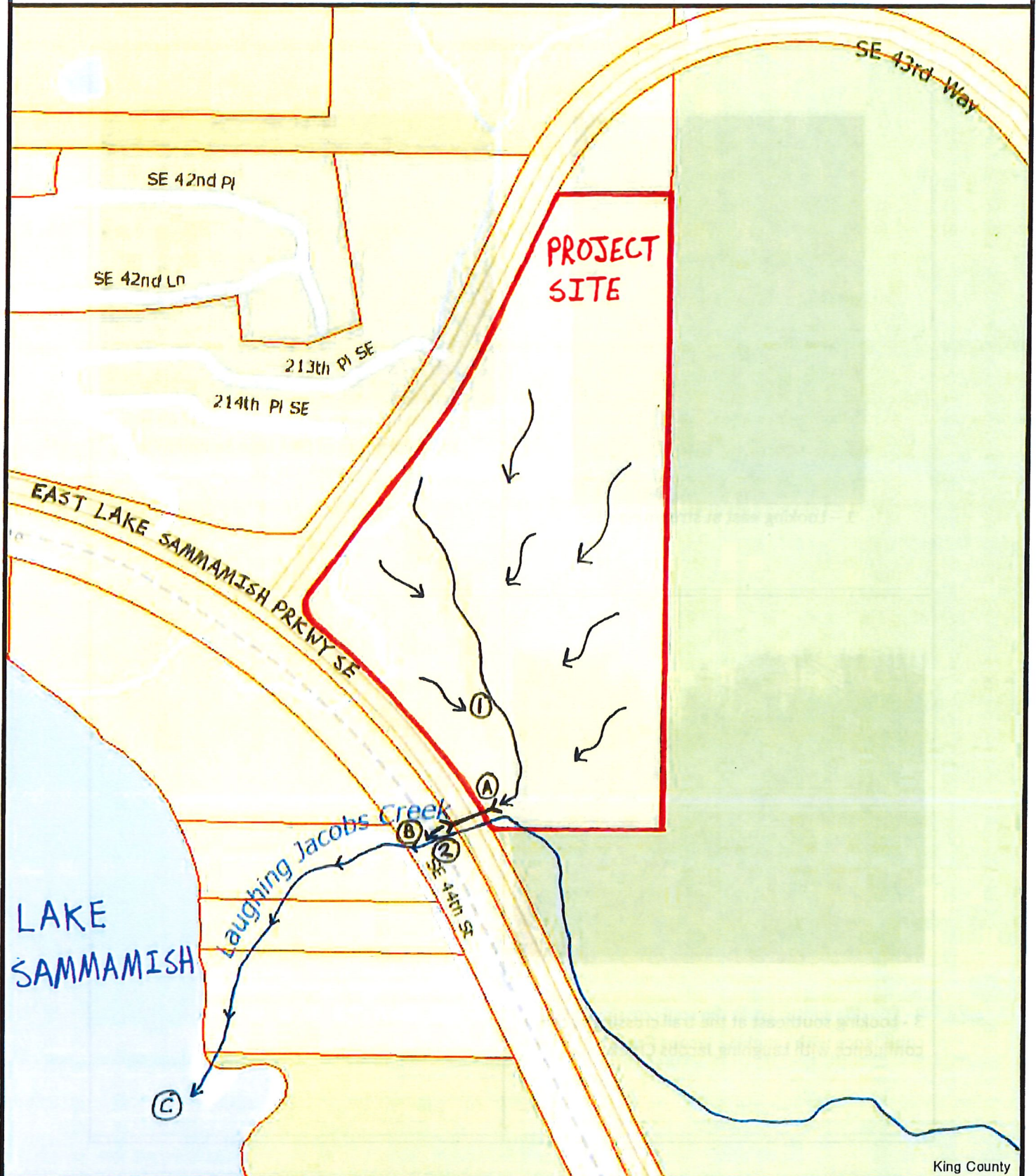


3 - Looking southeast at the trail crossing of the confluence with Laughing Jacobs Creek



Figure 3-1

## DOWNSTREAM DRAINAGE EXHIBIT



The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a survey product. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

Date: 12/8/2016

## **TASK 4 Drainage System Description and Problem Description**

A description of the existing drainage system has been included in the downstream analysis. Drainage complaints have also been included in Task 2.

## **TASK 5 Mitigation of Existing and Potential Problems**

### **Downstream Drainage Problems Requiring Special Attention**

#### Type 1 – Conveyance System Nuisance Problems

There are no known, reported or observed current downstream conveyance nuisance problems.

#### Type 2 – Severe Erosion Problems

There are no known, reported or observed current downstream severe erosion problems

#### Type 3-Severe Flooding Problems

There are no known, reported or observed current downstream severe flooding problems.

### **Downstream Water Quality Problems Requiring Special Attention**

The City of Issaquah Surface Water Design Manual Addendum, the current (2012) EPA approved Water Quality Assessment (303d) list for Washington State and the 2009 KCSWDM Reference 10, King County-Identified Water Quality Problems were reviewed for each of the seven downstream water quality problem types to a distance of one mile downstream of the project site. The following discussion includes reference to the updated (2012) 303(d) list of impaired water bodies.

#### Type 1 – Bacteria Problems

Laughing Jacobs Creek is listed as a Category 5 on the impaired water body list for bacteria.

<b>Listing ID: 15755</b>			
<b>Main Listing Information</b>			
<b>Listing ID:</b> 15755	<b>2014 Category:</b> 5		
<b>Waterbody Name:</b> LAUGHING JACOBS CREEK	<b>2012 Category:</b> 5		
<b>Medium:</b> Water	<b>2008 Category:</b> 5		
<b>Parameter:</b> Bacteria	<b>2004 Category:</b> 5		
<b>WQI Project:</b> None Assigned	<b>On 1998 303(d) List?:</b> Y		
<b>Designated Use:</b> None Assigned	<b>On 1996 303(d) List?:</b> Y		
<b>Assessment Unit</b>			
<b>Assessment Unit ID:</b> 17110012001600			
<b>Location Identification</b>			
<b>Counties:</b> King	<b>WRIA:</b> 8 - Cedar-Sammamish		
<b>Waterbody ID (WBID):</b> WA-08-1116	<b>Waterbody Class:</b> RAA		
<b>Town/Range/Section (Legacy):</b> 24N-6E-16			
<b>Basis</b>			
Location ID: [08L070] -- In water year 2004, 8 of 12 sample values (67%) showed an excursion of the % criterion for this waterbody (100 cfu/100mL). The geometric mean of 143.7 exceeds the geometric mean criterion (50 cfu/100mL).			
Hallock (2004), Dept. of Ecology ambient station 08L070 shows 2 of 3 samples (66.7%) in year 2003 exceeded the percentile criterion.			
Seattle-Metro unpublished data from station A670 (Near Mouth) exceeded the geometric mean criterion in 1987.			
<b>Remarks</b>			
<b>Remark</b>	<b>Modified By</b>	<b>Modified On</b>	<b>Visibility</b>
Combined Listing: Listing ID 45830 was rolled into this listing	Chad Brown	9/24/2015	Public
Impairment was determined by exceedance of the geometric mean criterion in water year(s)2004, and the percent criterion in water year(s) 2004 and calendar year 2003.	Jessica Archer	10/2/2014	Public
Policy 1-11 was revised in July 2012 to specify that bacteria is assessed according to water year (Oct 1-Sept 30) from the previous assessment period of calendar year. The water year assessment is only applied to newly assessed data. Therefore, this listing contains data assessed by both water year and calendar year.	Jessica Archer	10/2/2014	Public
<b>EIM</b>			
<b>User Study ID:</b>	<b>User Location ID:</b>		
AMS001	08L070		
AMS001	08L070		
AMS001E	08L070		

*Figure 3-2: Current Water Quality Conditions (Fecal Coliform Bacteria Levels)*

Type 2 – Dissolved Oxygen (DO) Problems

Laughing Jacobs Creek is listed as a Category 5 on the impaired water body list for dissolved oxygen.

Listing ID: 47948			
Main Listing Information			
Listing ID: 47948	2014 Category: 5		
Waterbody Name: LAUGHING JACOBS CREEK	2012 Category: 5		
Medium: Water	2008 Category: 5		
Parameter: Dissolved Oxygen	2004 Category: 3		
WQI Project: None Assigned	On 1998 303(d) List?: N		
Designated Use: None Assigned	On 1996 303(d) List?: N		
Assessment Unit			
Assessment Unit ID: 17110012001600			
Location Identification			
Counties: King	WRIA: 8 - Cedar-Sammamish		
Waterbody ID (WBID): None Assigned	Waterbody Class: RAA		
Town/Range/Section (Legacy): 24N-6E-16			
Basis			
Location ID: [08L070] – In 2004, 2 of 9 sample values (22%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;			
Location ID: [08L070] – In 2003, 0 of 3 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;			
Remarks			
Remark	Modified By	Modified On	Visibility
Category 5 based on historical data. Fewer than three excursions exist from all data considered.	Jessica Archer	10/3/2014	Public
EIM			
User Study ID:	User Location ID:		
AMS001	08L070		
AMS001E	08L070		

*Figure 3-3: Current Water Quality Conditions (Dissolved Oxygen Levels)*

### Type 3 – Temperature Problems

Laughing Jacobs Creek is listed as a Category 5 on the impaired water body list for temperature.

Listing ID: 72595	
Main Listing Information	
<b>Listing ID:</b> 72595	<b>2014 Category:</b> 5
<b>Waterbody Name:</b> LAUGHING JACOBS CREEK	<b>2012 Category:</b> 3
<b>Medium:</b> Water	<b>2008 Category:</b> 3
<b>Parameter:</b> Temperature	<b>2004 Category:</b> 3
<b>WQI Project:</b> None Assigned	<b>On 1998 303(d) List?:</b> N
<b>Designated Use:</b> None Assigned	<b>On 1996 303(d) List?:</b> N
Assessment Unit	
<b>Assessment Unit ID:</b> 17110012001600	
Location Identification	
<b>Counties:</b> King	<b>WRIA:</b> 8 - Cedar-Sammamish
<b>Waterbody ID (WBID):</b> None Assigned	<b>Waterbody Class:</b> None Assigned
<b>Town/Range/Section (Legacy):</b> 24N-6E-16	
Basis	
Location ID: KC_T_15c – In 2010, between 1/1/2010 and 12/31/2010, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 71 of 365 days (19%); The maximum exceedance during this period was 19.84°C for the 7-day period centered on 7/10/2010 ; (External Data Source: King County Database)	
Location ID: KC_T_15c – In 2009, between 1/1/2009 and 12/31/2009, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 101 of 365 days (28%); The maximum exceedance during this period was 21.52°C for the 7-day period centered on 7/30/2009 ; (External Data Source: King County Database)	
Location ID: KC_T_15c – In 2008, between 1/1/2008 and 12/31/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 50 of 366 days (14%); The maximum exceedance during this period was 18.88°C for the 7-day period centered on 7/1/2008 ; (External Data Source: King County Database)	
Location ID: KC_T_15c – In 2007, between 1/1/2007 and 12/31/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 75 of 365 days (21%); The maximum exceedance during this period was 19.09°C for the 7-day period centered on 7/13/2007 ; (External Data Source: King County Database)	
Location ID: KC_T_15c – In 2006, between 1/1/2006 and 12/31/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 95 of 365 days (26%); The maximum exceedance during this period was 19.99°C for the 7-day period centered on 7/24/2006 ; (External Data Source: King County Database)	

*Figure 3-4: Current Water Quality Conditions (Temperature Levels)*

#### Type 4 – Metals Problems

There are no known or reported downstream metals problems.

#### Type 5 – Phosphorous Problems

There are no known or reported downstream phosphorous problems.

#### Type 6 – Turbidity Problems

There are no known or reported downstream turbidity problems.

#### Type 7 – High pH Problems

There are no known or reported downstream turbidity problems.

#### Other

Laughing Jacobs Creek is listed as a Category 5 for bioassessment and a Category 4 for Ammonia-N.

<b>Listing ID: 70115</b>			
<b>Main Listing Information</b>			
<b>Listing ID:</b> 70115	<b>2014 Category:</b> 5		
<b>Waterbody Name:</b> LAUGHING JACOBS CREEK	<b>2012 Category:</b> 3		
<b>Medium:</b> Other	<b>2008 Category:</b> 3		
<b>Parameter:</b> Bioassessment	<b>2004 Category:</b> 3		
<b>WQI Project:</b> None Assigned	<b>On 1998 303(d) List?:</b> N		
<b>Designated Use:</b> None Assigned	<b>On 1996 303(d) List?:</b> N		
<b>Assessment Unit</b>			
<b>Assessment Unit ID:</b> 17110012001600			
<b>Location Identification</b>			
<b>Counties:</b> King	<b>WRIA:</b> 8 - Cedar-Sammamish		
<b>Waterbody ID (WBID):</b> None Assigned	<b>Waterbody Class:</b> None Assigned		
<b>Town/Range/Section (Legacy):</b> 24N-6E-18			
<b>Basis</b>			
Location ID [08LAK3879] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 28 in 2006, 30 in 2007, 24 in 2008, 32 in 2009, 16 in 2010			
<b>Remarks</b>			
<b>Remark</b>	<b>Modified By</b>	<b>Modified On</b>	<b>Visibility</b>
The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.	Patrick Lizon	12/22/2015	Private
The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.	Curtis Cooper	8/13/2015	Private
The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score $\leq 27$ and a RIVPACS score less than 0.73 indicates degraded biological integrity.	Curtis Cooper	8/13/2015	Public
<b>EIM</b>			
No EIM Records Entered			



<b>Listing ID: 71747</b>	
<b>Main Listing Information</b>	
<b>Listing ID:</b> 71747	<b>2014 Category:</b> 1
<b>Waterbody Name:</b> LAUGHING JACOBS CREEK	<b>2012 Category:</b> 3
<b>Medium:</b> Water	<b>2008 Category:</b> 3
<b>Parameter:</b> Ammonia-N	<b>2004 Category:</b> 3
<b>WQI Project:</b> None Assigned	<b>On 1998 303(d) List?:</b> N
<b>Designated Use:</b> None Assigned	<b>On 1996 303(d) List?:</b> N
<b>Assessment Unit</b>	
<b>Assessment Unit ID:</b> 17110012001600	
<b>Location Identification</b>	
<b>Counties:</b> King	<b>WRIA:</b> 8 - Cedar-Sammamish
<b>Waterbody ID (WBID):</b> None Assigned	<b>Waterbody Class:</b> None Assigned
<b>Town/Range/Section (Legacy):</b> 24N-6E-16	
<b>Basis</b>	
Location ID(s) [08L070] - In 2004, 0 out of 9 sample events exceeded the criterion.	
Location ID(s) [08L070] - In 2003, 0 out of 3 sample events exceeded the criterion.	
<b>Remarks</b>	
No Remarks Entered	
<b>EIM</b>	
<b>User Study ID:</b>	<b>User Location ID:</b>
AMS001E	08L070

#### Drainage Adjustments

There is no drainage adjustment proposed for this project.



## 4 FLOW CONTROL AND WATER QUALITY DESIGN

### 4.1 Existing Site Hydrology

The total site area for the plat including the critical areas and frontage improvement is 13.14 acres, however the total disturbed area is 4.5 acres. The existing parcel is completely forested with average slope ranging from 5 percent to greater than 40 percent with a large wetland on the south portion of the property. Per the geotechnical investigation completed by Golder Associates, "the subsurface stratigraphy at the project site consisted of topsoil overlying native deposits of glacial lacustrine sediments and/or sand and gravel deposits with the exception of TP-1 which encountered approximately 3-feet of fill overlying a buried topsoil layer which was underlain by sand and gravel."

The east portion of the site drains south to a large wetland on the south end of the property. The north and west portions of the site drains south west to an existing wetland and Many Springs Creek which flows south east into the large wetland on the south end of the property.

See Table 4-1 below and *Figure 4-1: Existing Conditions* provided in the following pages of this section. Historic site conditions (forested) are assumed for all predeveloped areas.

Table 4-1 Predeveloped Areas	
GROUND COVER	AREA (acres)
TOTAL	4.50

The peak flow rates for the pre-developed conditions as determined by KCRTS (one hour time steps) are shown below. A regional scale factor of LA 1.1 was used as determined by Figure 3.2.2.A.

Flow Frequency Analysis Time Series File:16066_predev.tsf Project Location:Landsburg							
---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----			
Flow Rate (CFS)	Rank	Time of Peak		- - Peaks - - (CFS)	Rank	Return Period	Prob
0.456	2	2/09/01 18:00		0.540	1	100.00	0.990
0.074	7	1/05/02 16:00		0.456	2	25.00	0.960
0.290	4	2/28/03 16:00		0.371	3	10.00	0.900
0.052	8	3/03/04 3:00		0.290	4	5.00	0.800
0.266	5	1/05/05 10:00		0.266	5	3.00	0.667
0.214	6	1/18/06 21:00		0.214	6	2.00	0.500
0.371	3	11/24/06 5:00		0.074	7	1.30	0.231
0.540	1	1/09/08 7:00		0.052	8	1.10	0.091
Computed Peaks				0.512		50.00	0.980

## 4.2 Developed Site Hydrology

This project includes 34 lots, two detention facilities and two water quality facilities. Frontage improvements will also be completed along SE 43<sup>rd</sup> Way which include widening of the existing pavement and reconstructing the existing sidewalk. The entry road and frontage improvements will drain to the West Vault located at the entrance to the plat. The lots and remaining roads will drain to the East Vault located to the west of Lot 5 and 6. Water Quality treatment will be provided by Modular Wetland Systems located downstream of each vault and discharge to Wetland A through a dispersion trench. Tract A and B are critical area tracts and will remain forested and have not been included in the Developed Conditions Areas that are summarized in Table 4-2 and *Figure 4-2 Developed Conditions Map*.

<b>Table 4-2 Developed Condition Areas</b>	
<b>GROUND COVER</b>	<b>AREA (acres)</b>
<b>East Basin</b>	
Till-Grass	1.70
<i>Lots</i>	<i>1.42</i>
<i>Storm</i>	<i>0.15</i>
<i>Tract C</i>	<i>0.09</i>
Impervious	2.32
<i>Lots</i>	<i>1.51</i>
<i>Storm</i>	<i>0.06</i>
<i>Tract C</i>	<i>0.79</i>
Total East	4.02
<b>West Basin</b>	
Till-Grass	0.08
Impervious	0.40
Total West	0.48
<b>TOTAL DEVELOPED AREA</b>	<b>4.50</b>

The undetained peak flow rates for the developed conditions as determined by KCRTS (one hour time steps) are shown below. Flow Frequency Analysis

### East Basin

Flow Frequency Analysis							
Time Series File:16066_deveast.tsf							
Project Location:Landsburg							
---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----			
Flow Rate	Rank	Time of Peak		- - Peaks - -	Rank	Return	Prob
(CFS)				(CFS)		Period	
1.10	4	2/09/01	2:00	2.01	1	100.00	0.990
0.654	8	12/03/01	17:00	1.33	2	25.00	0.960
1.10	5	9/10/03	15:00	1.28	3	10.00	0.900
1.28	3	8/26/04	1:00	1.10	4	5.00	0.800
1.05	7	10/28/04	18:00	1.10	5	3.00	0.667
1.09	6	10/22/05	17:00	1.09	6	2.00	0.500
1.33	2	11/21/06	9:00	1.05	7	1.30	0.231
2.01	1	1/09/08	7:00	0.654	8	1.10	0.091
Computed Peaks				1.79		50.00	0.980

### West Basin

Flow Frequency Analysis							
Time Series File:16066_devwest.tsf							
Project Location:Landsburg							
---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----			
Flow Rate	Rank	Time of Peak		- - Peaks - -	Rank	Return	Prob
(CFS)				(CFS)		Period	
0.154	7	2/09/01	2:00	0.267	1	100.00	0.990
0.102	8	12/03/01	17:00	0.195	2	25.00	0.960
0.180	4	9/10/03	15:00	0.192	3	10.00	0.900
0.195	2	8/26/04	1:00	0.180	4	5.00	0.800
0.163	6	10/28/04	18:00	0.169	5	3.00	0.667
0.169	5	10/22/05	17:00	0.163	6	2.00	0.500
0.192	3	10/26/06	3:00	0.154	7	1.30	0.231
0.267	1	1/09/08	7:00	0.102	8	1.10	0.091
Computed Peaks				0.243		50.00	0.980

## 4.3 Performance Standards

All stormwater facilities will be designed in accordance with the 2009 KCSWDM with the City of Issaquah Surface Water Design Manual Addendum, Attachment B, dated October 31, 2011, with Conservation Flow Control Standards. The proposed water quality treatment system will meet requirements from the Sensitive Lake Water Quality Protection Menu.

### Flow Control: Conservation Flow Control Standard

The Conservation Flow Control Standard requires maintaining the durations of high flows at their pre-development levels for all flows greater than one-half of the 2-year peak flow through the 50-year peak flow. The pre-development peak flow rates for the 2-year and 10-year runoff events must also be maintained under this requirement.

**Conveyance Capacity:**

The proposed conveyance system will be designed with sufficient capacity to convey and contain the 25-year peak flow as determined by the Rational Method. It will also be verified that the 100-year peak flow will not create or aggravate a severe flooding or erosion problem per Section 1.2.2.

**Water Quality: Sensitive Lake Water Quality Menu**

The Sensitive Lake Protection Water Quality Menu includes two pollutant removal targets and includes the control of phosphorous as follows:

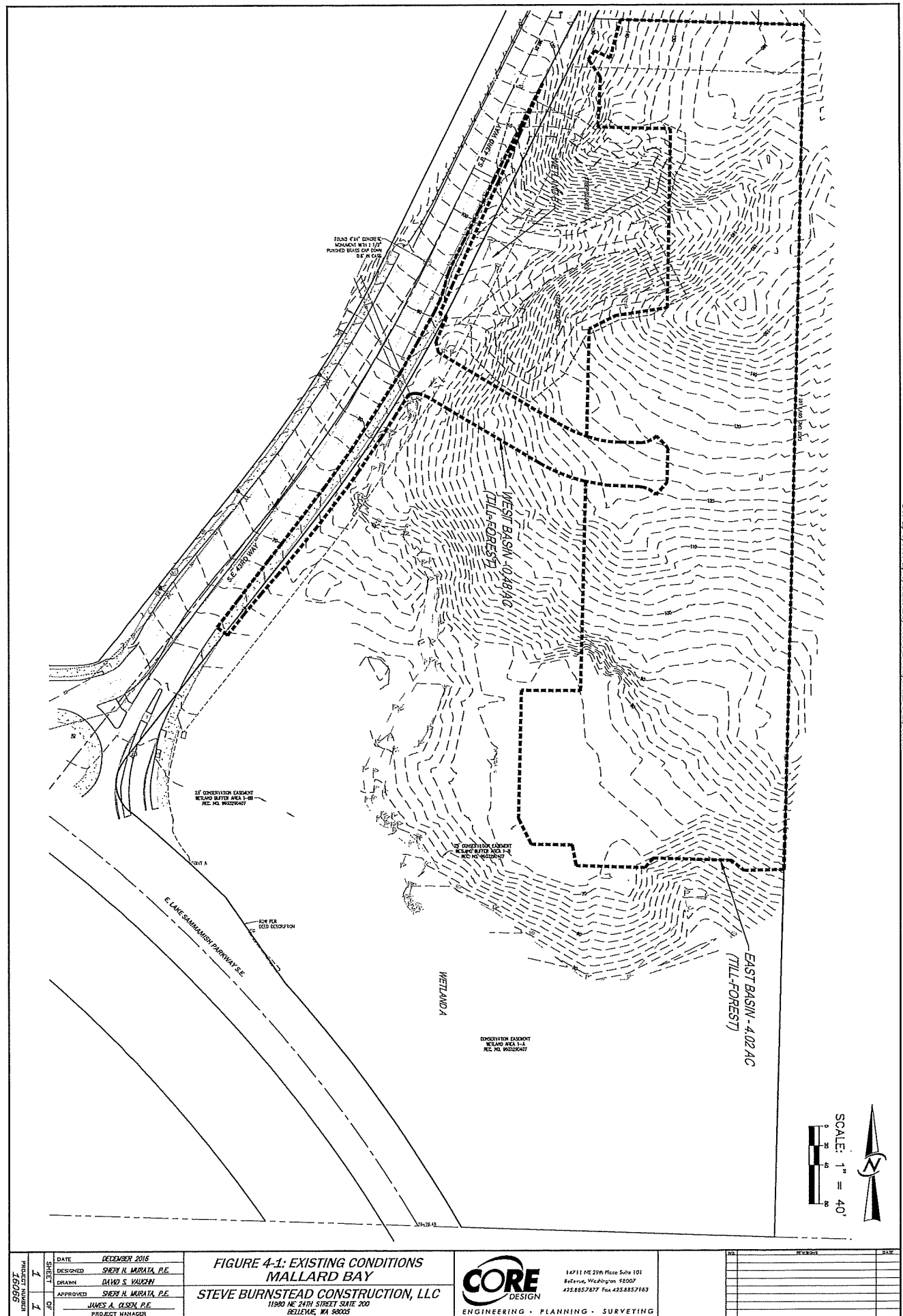
- Total Suspended Solids (TSS) = 80% reduction
- Total Phosphorus = 50% reduction

The Sensitive Lake Protection Menu, described in detail in Section 6.1.3 provides four options to meet the pollutant removal targets listed above.

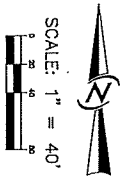
- Option 1: Large Wetpond
- Option 2: Large Sand Filter
- Option 3: Two-Facility Treatment Train
- Option 4: Basic Menu Plus Phosphorous Credit

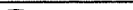
In lieu of the four options above, the project is proposing to use two Modular Wetland System manufactured by Bio Clean Environmental Services, Inc. for the road to treat the pollution generating area. The Modular Wetlands System have general use level designation for both Basic and Phosphorus treatment, which meet the Sensitive Lake treatment goals of TSS and total phosphorus.

More detailed discussion and sizing calculations of the flow control and water quality treatment facility proposed for this project follows later in this section.



SW 1/4, NW 1/4, SEC. 16, TWP. 24 N., RGE. 6 E., WM.



PROJECT NUMBER 100056	SHEET 1 OF 1	DATE	DECEMBER 2015	FIGURE 4-1: EXISTING CONDITIONS MALLARD BAY  STEVE BURNSTEAD CONSTRUCTION, LLC 11980 NE 24TH STREET SUITE 200 BELLEVUE, WA 98005	 14711 NE 25th Place Suite 101 Bellevue, Washington 98007 425.855.7877 Fax 425.855.7183  ENGINEERING • PLANNING • SURVEYING	NO.	REVISION	DATE
		DESIGNED	SHERI H. MURATA, P.E.					
		DRAWN	DAVID S. VAUGHN					
		APPROVED	SHERI H. MURATA, P.E.					
		JAMES A. OLSON, P.E.						
PROJECT MANAGER								





## 4.4 Flow Control System

### Calculation of Impervious Area

The minimum impervious area per lot per the 2009 KCSWDM (page 3-27) would either be 4,000 square feet per lot or the maximum impervious area per zoning, whichever is less.

However, based on the AAS and Interpretation for Mallard Bay document issued on September 25, 2016 the amount of impervious surface that can be built on the property under the MF-H zone is 283,200 square feet which is 50% of the property total of 566,400 square feet. The project is subdividing the property into residential lots which doesn't influence the stated purpose of the Issaquah Municipal Code. Therefore, the City shall consider the project compliant with IMC 18.07.050 so long as the plat does not exceed 283,200 square feet.

### Flow Control BMPs/Individual Lot BMPs

This project will not be served by an infiltration facility and therefore must apply flow control BMPs to supplement the flow mitigation provided by the detention vaults. This project has lots under 22,000 square feet so it is subject to the small lot BMP requirements. Full dispersion and full infiltration of the roof runoff is not feasible, so one or more of the following BMPs must be applied to an impervious area equal to at least 10% of the lot for lots up to 11,000 square feet and 20% of the lot for lots between 11,000 and 22,000 square feet. For projects in a critical aquifer recharge area these impervious area amounts must be doubled. Therefore, this project is required to provide BMPs for 20% of the lot area.

- Limited Infiltration
- **Basic Dispersion**
- Rain Garden
- Permeable Pavement
- Rainwater Harvesting
- Vegetated Roof
- Reduced Impervious Surface Credit
- Native Growth Retention Credit

The individual lot BMP requirement will be met through basic dispersion since both detention vaults will discharge to Wetland A through a basic dispersion trench.



SW 1/4, NW 1/4, SEC. 16, TWP. 24 N., RGE. 6 E., W.M.

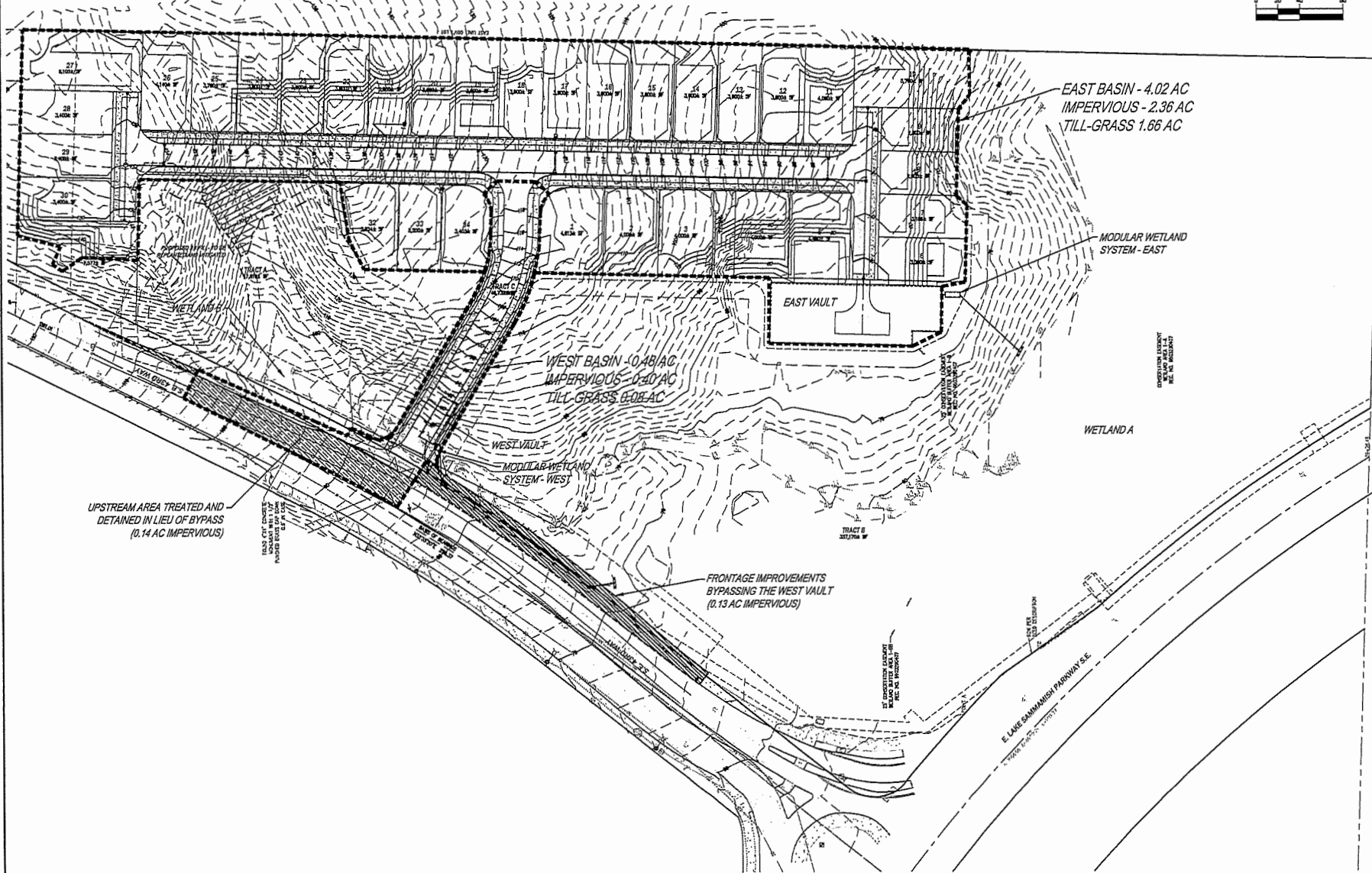
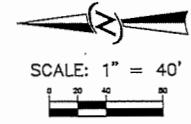


FIGURE 4-2: DEVELOPED CONDITIONS  
MALLARD BAY

STEVE BURNSTEAD CONSTRUCTION, LLC  
11800 KALAMAZOO AVENUE, SUITE 200  
MUSKEGON, MI 49829

DATE	DECEMBER 2016
DESIGNED	SHERA L. MERRITT, P.E.
DRAWN	DAVID A. THORNTON
APPROVED	SHERA L. MERRITT, P.E.
	JAMES A. OLSEN, P.E.
	PROJECT MANAGER
SHEET	OF
1	1
PROJECT NUMBER	16066

CORE DESIGN  
ENGINEERING • PLANNING • SURVEYING

14011 AS 204, Rev. 4-14-10  
Mallard Bay, Project 16066  
425.832.7977 Fax 425.832.7953



### West Vault

The West Vault has been sized to receive runoff from the entry road and frontage improvements on SE 43<sup>rd</sup> Way. Due to topographic constraints, the frontage improvements south of the entry road will bypass the West Vault. Therefore, an equivalent area north of the entry road has been collected in lieu of the bypass area. The West Vault will not meet the flow control standard alone. Therefore, the East vault will over detain the runoff from lots and remaining roads and the point of compliance has been established downstream of both vaults in Wetland A. Therefore, it is the combined outflow of the West vault and the East Vault that will meet the Level 2 flow control standard. The KCRTS Vault summary for the West vault is shown below:

### West - KCRTS Vault Calculation

Type of Facility: Detention Vault				
Facility Length:	42.00	ft		
Facility Width:	14.00	ft		
Facility Area:	588.	sq. ft		
Effective Storage Depth:	10.00	ft		
Stage 0 Elevation:	0.00	ft		
Storage Volume:	5880.	cu. ft		
Riser Head:	12.00	ft		
Riser Diameter:	10.00	inches		
Number of orifices:	3			
Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	0.38	0.013	
2	6.00	0.50	0.017	4.0
3	8.00	0.75	0.031	4.0
Top Notch Weir: None				
Outflow Rating Curve: None				

The proposed detention vault includes a three orifice control structure. The first orifice is 3/8 inch in diameter and is at the bottom of the riser. The second orifice is 6 feet above the vault outlet elevation and is 1/2-inch in diameter and the third orifice is 8 feet above the vault outlet and is 3/4 of an inch in diameter. The proposed vault will have a maximum storage volume of 5,920 cubic feet with 10.07 feet of live storage.

Hyd	Inflow	Outflow		Peak		Storage	
		Target	Calc	Stage	Elev	(Cu-Ft)	(Ac-Ft)
1	0.27	*****	0.26	10.07	10.07	5920.	0.136
2	0.18	0.04	0.14	10.03	10.03	5898.	0.135
3	0.15	*****	0.14	10.03	10.03	5898.	0.135
4	0.10	*****	0.04	9.31	9.31	5472.	0.126
5	0.11	*****	0.04	9.02	9.02	5304.	0.122
6	0.09	0.01	0.02	7.97	7.97	4684.	0.108
7	0.20	*****	0.02	6.96	6.96	4094.	0.094
8	0.10	*****	0.01	4.73	4.73	2782.	0.064

### East - KCRTS Vault Calculation

Type of Facility: Detention Vault				
Facility Length:	126.49	ft		
Facility Width:	63.25	ft		
Facility Area:	8000.	sq. ft		
Effective Storage Depth:	10.00	ft		
Stage 0 Elevation:	66.50	ft		
Storage Volume:	80000.	cu. ft		
Riser Head:	10.00	ft		
Riser Diameter:	12.00	inches		
Number of orifices:	3			
Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	1.13	0.109	
2	6.00	1.25	0.085	4.0
3	8.00	1.25	0.060	4.0
Top Notch Weir: None				
Outflow Rating Curve: None				

The proposed detention vault includes a three orifice control structure. The first orifice is 1 1/8 inch in diameter and is at the bottom of the riser. The second orifice is 6 feet above the vault outlet elevation and is 1 1/4-inches in diameter and the third orifice is 8 feet above the vault outlet elevation and is 1 1/4 inches in diameter. The proposed vault will have a maximum storage volume of 88,002 cubic feet with 10.23 feet of live storage.

Hyd	Inflow	Outflow	Peak Stage	Elev	Storage (Cu-Ft)	(Ac-Ft)
1	2.01	1.54	10.26	76.76	82052.	1.884
2	1.33	0.24	9.65	76.15	77230.	1.773
3	1.10	0.23	9.28	75.78	74261.	1.705
4	0.66	0.14	7.40	73.90	59179.	1.359
5	0.76	0.14	7.10	73.60	56767.	1.303
6	0.63	0.07	4.41	70.91	35246.	0.809
7	1.28	0.06	3.38	69.88	27050.	0.621
8	0.53	0.06	2.70	69.20	21630.	0.497

Hyd	R/D Facility Outflow	Tributary Inflow	Reservoir Inflow	POC Outflow Target	Calc
1	1.54	0.26	*****	*****	1.73
2	0.24	0.14	*****	0.45	0.34
3	0.23	0.11	*****	*****	0.31
4	0.14	0.04	*****	*****	0.17
5	0.14	0.04	*****	*****	0.17
6	0.07	0.02	*****	0.21	0.09
7	0.06	0.02	*****	*****	0.08
8	0.06	0.01	*****	*****	0.06

Since the point of compliance is downstream of both vaults, the outflow of the West vault was modeled as a tributary time series file to the East vault. Therefore, the outflow at the point of compliance is 0.09 cfs for the 2-year event and 0.34 cfs for the 10-year event. Both the 2-year and 10-year release rates are below the target flow rate of 0.21 cfs and 0.45 cfs respectively.

The flow duration comparison analysis results for the provided detention vault are shown below and there is no positive excursion.

Duration Comparison Analysis							
Base File: 16066_predev.tsf							
New File: dsout.tsf							
Cutoff Units: Discharge in CFS							
Cutoff	-----Fraction of Time-----			Probability	-----Check of Tolerance-----		
	Base	New	%Change		Base	New	%Change
0.106	0.10E-01	0.82E-02	-20.2	0.10E-01	0.106	0.096	-9.8
0.133	0.70E-02	0.53E-02	-23.7	0.70E-02	0.133	0.118	-11.5
0.160	0.47E-02	0.25E-02	-47.4	0.47E-02	0.160	0.139	-13.1
0.187	0.31E-02	0.18E-02	-43.2	0.31E-02	0.187	0.152	-18.5
0.214	0.21E-02	0.15E-02	-28.6	0.21E-02	0.214	0.169	-21.0
0.241	0.15E-02	0.90E-03	-40.2	0.15E-02	0.241	0.211	-12.2
0.267	0.10E-02	0.54E-03	-47.6	0.10E-02	0.267	0.236	-11.8
0.294	0.78E-03	0.15E-03	-81.3	0.78E-03	0.294	0.251	-14.8
0.321	0.57E-03	0.33E-04	-94.3	0.57E-03	0.321	0.265	-17.5
0.348	0.33E-03	0.00E+00	-100.0	0.33E-03	0.348	0.281	-19.1
0.375	0.20E-03	0.00E+00	-100.0	0.20E-03	0.375	0.289	-22.9
0.401	0.15E-03	0.00E+00	-100.0	0.15E-03	0.401	0.294	-26.7
0.428	0.98E-04	0.00E+00	-100.0	0.98E-04	0.428	0.304	-29.0
0.455	0.16E-04	0.00E+00	-100.0	0.16E-04	0.455	0.337	-26.0

There is no positive excursion

Maximum negative excursion = 0.125 cfs (-29.1%)  
 occurring at 0.429 cfs on the Base Data:16066\_predev.tsf  
 and at 0.304 cfs on the New Data:dsout.tsf

## 4.5 Water Quality Calculations

Water Quality treatment is required for new and replaced pollution generating impervious surfaces and new pollution generating pervious surfaces (PGIS).

Modular Wetland units are proposed to meet the sensitive lake water quality treatment standard. It has general use level designation for Basic, Enhanced and Phosphorus treatment from the Department of Ecology. The stormwater flows into a pretreatment chamber where the trash and debris are separated before entering the pre-filter cartridges. The pre-filter cartridge uses BioMediaGREEN filter material and removes over 80% of TSS and 90% of hydrocarbons and also prevents pollutants from clogging the biofiltration chamber.

The biofiltration chamber incorporates horizontal flow to filter the stormwater through the WetlandMEDIA before discharging to a vertical underdrain manifold in the center of the WetlandMEDIA and through the outlet pipe. The expected pollutant removal is:

- TSS Removal – 85%
- Total Phosphorus – 64%
- Ortho Phosphorus – 67%
- Dissolved Zinc – 66%
- Dissolved Copper – 38%
- Nitrogen Removal – 45%
- Total Zinc – 69%
- Total Copper – 50%
- Motor Oil – 95%

Since the expectant pollutant removal is 85% for TSS and 60% to 64% for phosphorus removal, it meets the sensitive lake treatment requirements of 80% TSS removal and 50% phosphorus removal.

There will be a Modular Wetland System downstream of each of the proposed detention vaults that have been sized based on the 2-year detained flow rate and the treatment flow sizing table below:

**Treatment Flow Sizing Table**

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft <sup>2</sup>	0.052
MWS-L-4-6	4' x 6'	32 ft <sup>2</sup>	0.073
MWS-L-4-8	4' x 8'	50 ft <sup>2</sup>	0.115
MWS-L-4-13	4' x 13'	63 ft <sup>2</sup>	0.144
MWS-L-4-15	4' x 15'	76 ft <sup>2</sup>	0.175
MWS-L-4-17	4' x 17'	90 ft <sup>2</sup>	0.206
MWS-L-4-19	4' x 19'	103 ft <sup>2</sup>	0.237
MWS-L-4-21	4' x 21'	117 ft <sup>2</sup>	0.268
MWS-L-8-8	8' x 8'	100 ft <sup>2</sup>	0.230
MWS-L-8-12	8' x 12'	151 ft <sup>2</sup>	0.346
MWS-L-8-16	8' x 16'	201 ft <sup>2</sup>	0.462

#### MWS -West

2-year detained flowrate = 0.02 cfs

Based on a treatment flow rate of 0.052 cfs, the MWS-L-4-4 will be sufficient for the 2-year discharge from the West Vault.

#### MWS -East

2-year detained flowrate = 0.07 cfs

Based on a treatment flow rate of 0.115 cfs, the MWS-L-4-8 will be sufficient based on the 2-year discharge from the East Vault.



## **5 CONVEYANCE SYSTEM ANALYSIS AND DESIGN**

Conveyance calculations to be provided with final engineering.

THIS PAGE INTENTIONALLY LEFT BLANK

## **6 SPECIAL REPORTS AND STUDIES**

(Under separate cover)

- **Mallard Bay Residential Traffic Impact Analysis**  
Prepared by: Jeff Schramm  
Dated: December 14, 2016  
TENW  
11400 SE 8<sup>th</sup> Street, Suite 200  
Bellevue, Wa 98004
  
- **Arborist Report, Mallard Bay**  
Prepared by: Favero Greenforest, ISA Certified Arborist  
Dated: December 15, 2016  
Greenforest Incorporated  
4547 S Lucile Street  
Seattle, WA 98118
  
- **Mallard Bay: Geotechnical Report and Critical Areas Study**  
Prepared by: Steve Van Shaar, P.E.  
Dated: December 15, 2016  
Golder Associates Inc.  
18300 NE Union Hill Road, Suite 200  
Redmond, WA 98052
  
- **Critical Areas Report and Conceptual Mitigation Plan**  
Prepared by: Bill Shiels, Ann Olsen and David Teesdale  
Dated: December 16, 2016  
Talasaea Consultants, Inc.  
15020 Bear Creek Road NE  
Woodinville, WA 98077

THIS PAGE INTENTIONALLY LEFT BLANK

## **7 OTHER PERMITS**

- NPDES Permit
- Building Permits
- ROW Use Permit
- Site Work Permit

THIS PAGE INTENTIONALLY LEFT BLANK

## **8 ESC ANALYSIS AND DESIGN**

Erosion and sediment control analysis to be provided during final engineering.

THIS PAGE INTENTIONALLY LEFT BLANK



## **9 BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT**

### **9.1 Bond Quantities**

A bond quantity worksheet will be provided during final engineering.

### **9.2 Facility Summaries**

Not applicable.

### **9.3 Declaration of Covenant**

A Declaration of Covenant will be provided during final engineering.

THIS PAGE INTENTIONALLY LEFT BLANK

## **10 OPERATIONS AND MAINTENANCE**

The operations and maintenance information will be provided through select portions from Appendix A of the 2009 KCSWDM during Final Engineering.

THIS PAGE INTENTIONALLY LEFT BLANK



## Appendix A

### Parcel & Basin Information

- King County Parcel Report
- Figure 2-2 Stormwater Drainage Sub-basins in Issaquah



## King County Department of Assessments

Fair, Equitable, and Understandable Property Valuations

You're In: [Assessor](#) >> [Look up Property Info](#) >> [eReal Property](#)Department  
of  
Assessments500 Fourth  
Avenue,  
Suite ADM-  
AS-0708  
Seattle, WA  
98104Office Hours:  
Mon - Fri  
8.30 a.m. to  
4.30 p.m.TEL: 206-  
296-7300  
FAX: 206-  
296-5107  
TTY: 206-  
296-7888[Send us  
mail](#)

## ADVERTISEMENT

[New Search](#) [Property Tax Bill](#) [Map This Property](#) [Glossary of Terms](#) [Area Report](#) [Print Property Detail](#) 

## PARCEL DATA

Parcel	162406-9007	Jurisdiction	ISSAQUAH
Name	ISSAQUAH CITY OF	Levy Code	1437
Site Address		Property Type	R
Residential Area	047-001 (NE Appraisal District)	Plat Block / Building Number	
Property Name	teardown	Plat Lot / Unit Number	
		Quarter-Section-Township-Range	NW-16-24-6

## Legal Description

POR GOVT LOT 1 LY BTWN E LK SAMMAMISH PIKWAY SE & SE 43RD WAY LESS N 70.7 FT THOF PER B.A.L.D SP  
WAIVER 6-88  
Plat Block:  
Plat Lot:

## LAND DATA

Highest & Best Use As If Vacant	MULTI-FAMILY DWELLING
Highest & Best Use As Improved	INTERIM USE
Present Use	Single Family(C/I Zone)
Land SqFt	573,502
Acres	13.17

Percentage Unusable	0
Unbuildable	NO
Restrictive Size Shape	NO
Zoning	MF-H
Water	WATER DISTRICT
Sewer/Septic	PUBLIC
Road Access	PUBLIC
Parking	
Street Surface	PAVED

## Views

Rainier	
Territorial	
Olympics	
Cascades	
Seattle Skyline	
Puget Sound	
Lake Washington	
Lake Sammamish	AVERAGE
Lake/River/Creek	
Other View	

## Waterfront

Waterfront Location	
Waterfront Footage	0
Lot Depth Factor	0
Waterfront Bank	
Tide/Shore	
Waterfront Restricted Access	
Waterfront Access Rights	NO
Poor Quality	NO
Proximity Influence	NO

## Designations

Historic Site	
Current Use	(none)
Nbr Bldg Sites	
Adjacent to Golf Fairway	NO
Adjacent to Greenbelt	NO
Other Designation	NO
Deed Restrictions	NO
Development Rights Purchased	NO
Easements	NO
Native Growth Protection Easement	NO
DNR Lease	NO

## Nuisances

Topography	YES
Traffic Noise	HIGH
Airport Noise	
Power Lines	NO
Other Nuisances	NO

## Problems

Water Problems	NO
Transportation Concurrence	NO
Other Problems	NO

## Environmental

Environmental	YES
---------------	-----

Environmental Type	Information Source	Delineation study	Percentage Affected
LandslideHazard	JURISDICTION	N	0
ErosionHazard	JURISDICTION	N	0
Stream	JURISDICTION	N	0

## BUILDING

## TAX ROLL HISTORY

This is a government owned parcel.

Reference  
Links:

- [King County Tax Links](#)
- [Property Tax Advisor](#)
- [Washington State Department of Revenue \(External link\)](#)
- [Washington State Board of Tax Appeals \(External link\)](#)
- [Board of Appeals/Equalization](#)
- [Districts Report](#)
- [iMap](#)
- [Recorder's Office](#)

[Scanned images of surveys and other map documents](#)

## ADVERTISEMENT

Change to state law (RCW 84. 40.045 and 84.40.175) by the 2013 Legislature eliminated revaluation of government owned parcels.

#### SALES HISTORY

Excise Number	Recording Number	Document Date	Sale Price	Seller Name	Buyer Name	Instrument	Sale Reason
2774491	20151231001105	12/29/2015	\$203,232.00	KING COUNTY	ISSAQUAH CITY OF	Quit Claim Deed	Other
2598900		2/1/2013	\$0.00	KING COUNTY FINANCE	KING COUNTY PROPERTY SERVICES	DEED	Other
2461518	20101006001210	10/1/2010	\$0.00	GIBBON KARNE L	SHERRON ASSOCIATES LOAN FUND XXV MALLARD LLC	Trustees' Deed	Foreclosure
2445494	20100811000629	6/9/2010	\$0.00	KELLER THOMAS M	PEACHEY COLLEEN+KING KASEY+KATHRYN	Special Warranty Deed	Estate Settlement
2445378	20100810000832	5/21/2010	\$0.00	HAMILTON EVAN D+SCHWINDT JENIFER A	HAMILTON ROBERT L	Quit Claim Deed	Partial Interest (love and affection, gift)
2401785	20090730000001	7/28/2009	\$0.00	NELSON MONA E	OAKES RUSSELL+ROBERT ET AL	Deed of Personal Representative	Estate Settlement
2393436	20090317000844	3/13/2009	\$0.00	FRENCH ROBERT W	FRENCH LEONARD F	Deed of Personal Representative	Estate Settlement
2373574		12/3/2008	\$0.00	GOEBEL DONALD L	GOEBEL DONALD L+RUSSELL A	Quit Claim Deed	Trust
2352397	20080827000275	8/3/2008	\$0.00	VERMEULEN JOSEPHINE S	VERMEULEN JOSEPHINE S -GST EXEMPT FAMILY TRUST	Quit Claim Deed	Trust
2342877	20080424001033	4/1/2008	\$0.00	HAMILTON ROBERT L	HAMILTON EVAN D+SCHWINDT JENNIFER A	Quit Claim Deed	Tenancy Partition
2342886	20080424001087	4/1/2008	\$0.00	HAMILTON EVAN D	HAMILTON EVAN D+SCHWINDT JENNIFER A	Quit Claim Deed	Tenancy Partition
2319954	20071114000458	11/12/2007	\$0.00	CLEMENTS DAVID B	CLEMENTS ALISON % MALLARD BAY LLC	Deed of Personal Representative	Trust
2323239	20071205001440	11/2/2007	\$0.00	VERMEULEN ADRIAN -REV LIVING TRUST	VERMEULEN JOSEPHINE S+ADRIAN -TRUST	Quit Claim Deed	Trust
2305660	20070822000328	8/13/2007	\$0.00	REYNOLDS JOHN D	LIFELONG AIDS ALLIANCE	Quit Claim Deed	Trust
2096813		12/3/2004	\$0.00	FRONTIER BANK	PACIFIC COAST INVESTMENT CO	Statutory Warranty Deed	Other
1902574	20020808000231	4/30/2002	\$0.00	PACIFIC COAST INVESTMENT CO	PACIFIC COAST INVESTMENT CO	Quit Claim Deed	Trust
1885499	20020520002608	3/15/2002	\$0.00	HOPE ALBERT W	PACIFIC COAST INVESTMENT CO	Quit Claim Deed	Trust
1883278	20020501000845	2/27/2002	\$0.00	SHACKLETON BRIAN L		Quit Claim Deed	(Unknown)
1793604	20001226000318	10/3/2000	\$0.00	PACIFIC COAST INVESTMENT CO	PACIFIC COAST INVESTMENT CO	Quit Claim Deed	Partial Interest (love and affection, gift)
1777982	20000925000173	9/25/2000	\$0.00	MALTMAN REED NORTH AHRENS & MALNATI INC	PACIFIC COAST INVESTMENT CO	Trustees' Deed	Trust
1476599	199503290405	3/28/1995	\$4,310,598.00	TYEE SAMMAMISH PARTNERSHIP	TYEE L L C	Statutory Warranty Deed	None
1413145	199501180927	1/18/1995	\$2,502,193.00	LAKE SAMMAMISH ASSOCIATES	TYEE SAMMAMISH PARTNERSHIP	Warranty Deed	None

#### REVIEW HISTORY

Tax Year	Review Number	Review Type	Appealed Value	Hearing Date	Settlement Value	Decision	Status
2012	1105148	Local Appeal	\$2,430,000	1/1/1900	\$0		Completed

#### PERMIT HISTORY

Permit Number	Permit Description	Type	Issue Date	Permit Value	Issuing Jurisdiction	Reviewed Date
DEM08-09	Demolish existing bldgs. & underground fuel tank for Mallard Bay Tax Lot 7	Demolition	8/22/2008	\$0	ISSAQUAH	8/12/2009

#### HOME IMPROVEMENT EXEMPTION

[New Search](#)
[Property Tax Bill](#)
[Map This Property](#)
[Glossary of Terms](#)
[Area Report](#)
[Print Property Detail](#)

ADVERTISEMENT

Updated: March 17, 2016

[Share](#)
[Tweet](#)
[Email](#)
[Print](#)



#### Information for...

[Residents](#)  
[Businesses](#)  
[Job seekers](#)  
[Volunteers](#)  
[King County employees](#)

#### Do more online

[Trip Planner](#)  
[Property tax information & payment](#)  
[Jail inmate look up](#)  
[Parcel viewer or iMap](#)  
[Public records](#)  
[More online tools...](#)

#### Contact us

[206-296-0100](#)  
[Email us](#)  
[Staff directory](#)  
[Customer service](#)  
[Report a problem](#)  
[Subscribe to alerts](#)

Stay connected! [View King County social media](#)



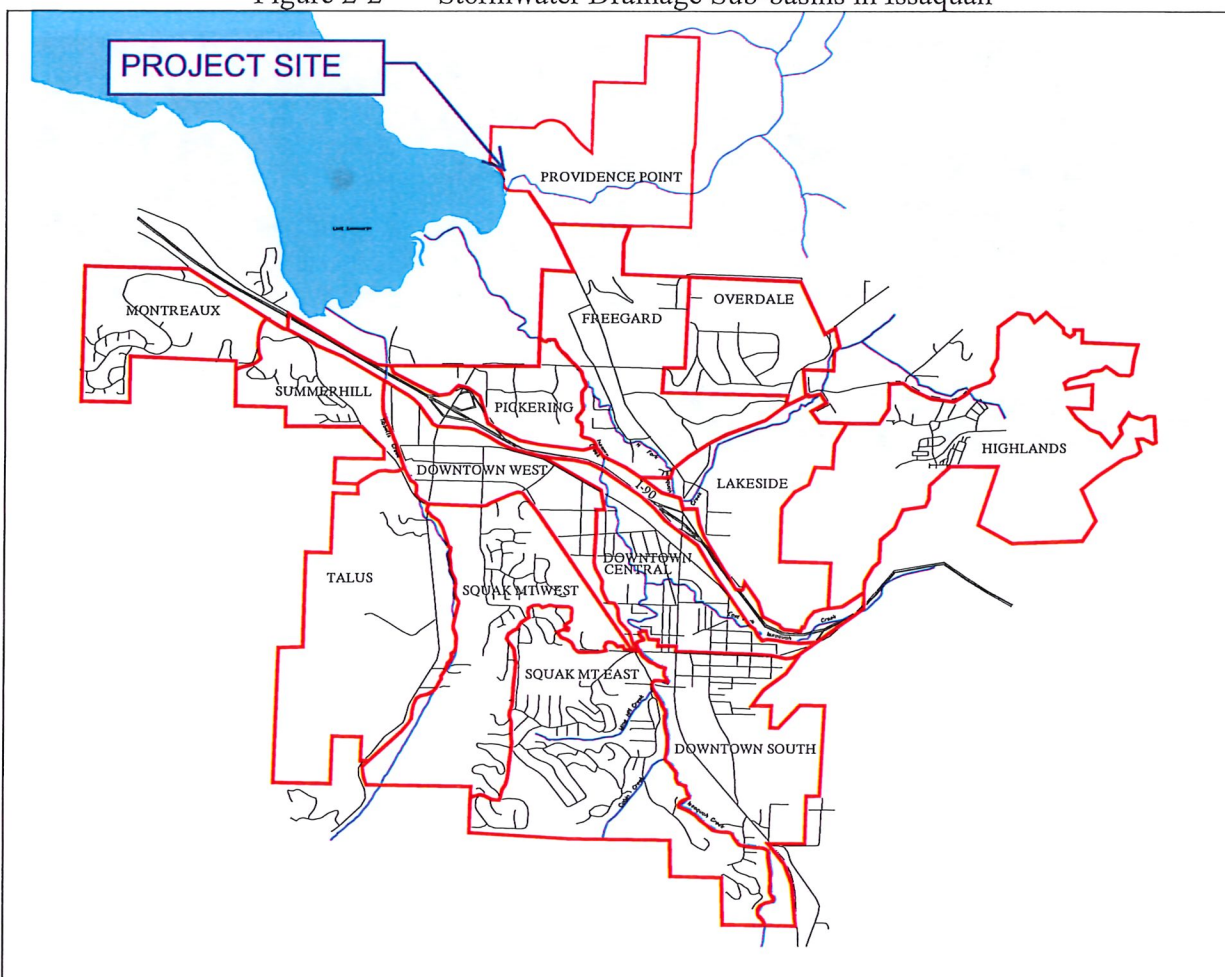
© King County, WA 2016 [Privacy](#) [Accessibility](#) [Terms of use](#)

#### Information for...

#### Contact us

#### Do more online

Figure 2-2 Stormwater Drainage Sub-basins in Issaquah



### 2.2.3 Fish Usage

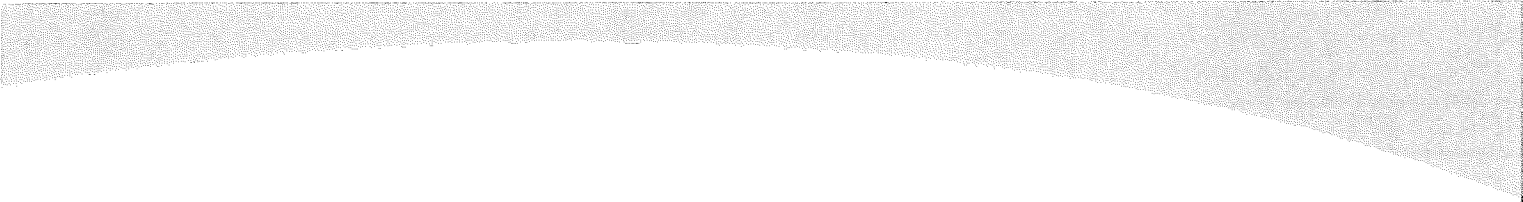
Table 2-4 summarizes the important fish species that are present in the principal streams in Issaquah, as reported by the Final Issaquah Creek Basin and Non-point Action Plan and the Issaquah Creek Basin Draft Sub-Area Summary.

**Table 2-4 Fish Presence in Issaquah Streams**

Stream	Species
Issaquah Creek	Chinook, Sockeye, Steelhead, Dolly Varden, Coho, Cutthroat, Rainbow, Kokanee, Bull trout
North Fork Issaquah Creek	Sockeye, Coho, Cutthroat
East Fork Issaquah Creek	Sockeye, Coho, Cutthroat, Chinook, Rainbow
Tibbetts Creek	Coho, Sockeye, Cutthroat


Major species of salmon are described below:

- **Chinook salmon**, also called "king," is the largest of the Pacific Salmon. Chinook have been observed spawning 11 miles upstream on Issaquah Creek in Holder and Carey creeks. They are often found spawning in rivers or larger streams, and are usually one of the earlier salmon species to spawn in the fall. Chinook salmon in Issaquah Creek is entirely of hatchery origin,



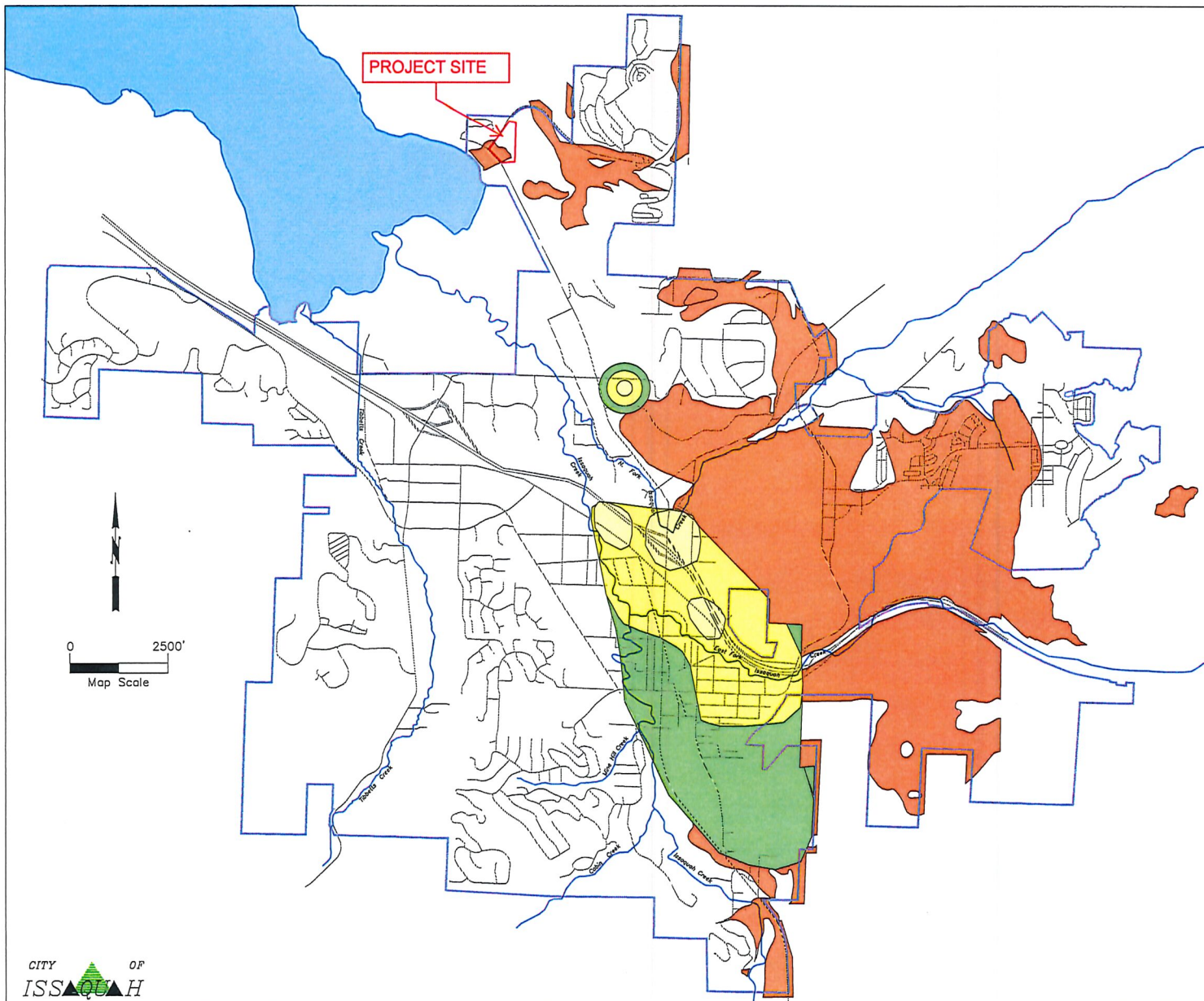
## Appendix B

### Resource Review & Off-site Analysis Documentation

- Critical Aquifer Recharge Area Classification Map
    - FEMA Map (53033C069H)
    - USDA NRCS Site Soils Map
    - Drainage Complaints Exhibit
- 







## CRITICAL AQUIFER RECHARGE AREA CLASSIFICATION MAP

### LEGEND

#### CARA CLASSES

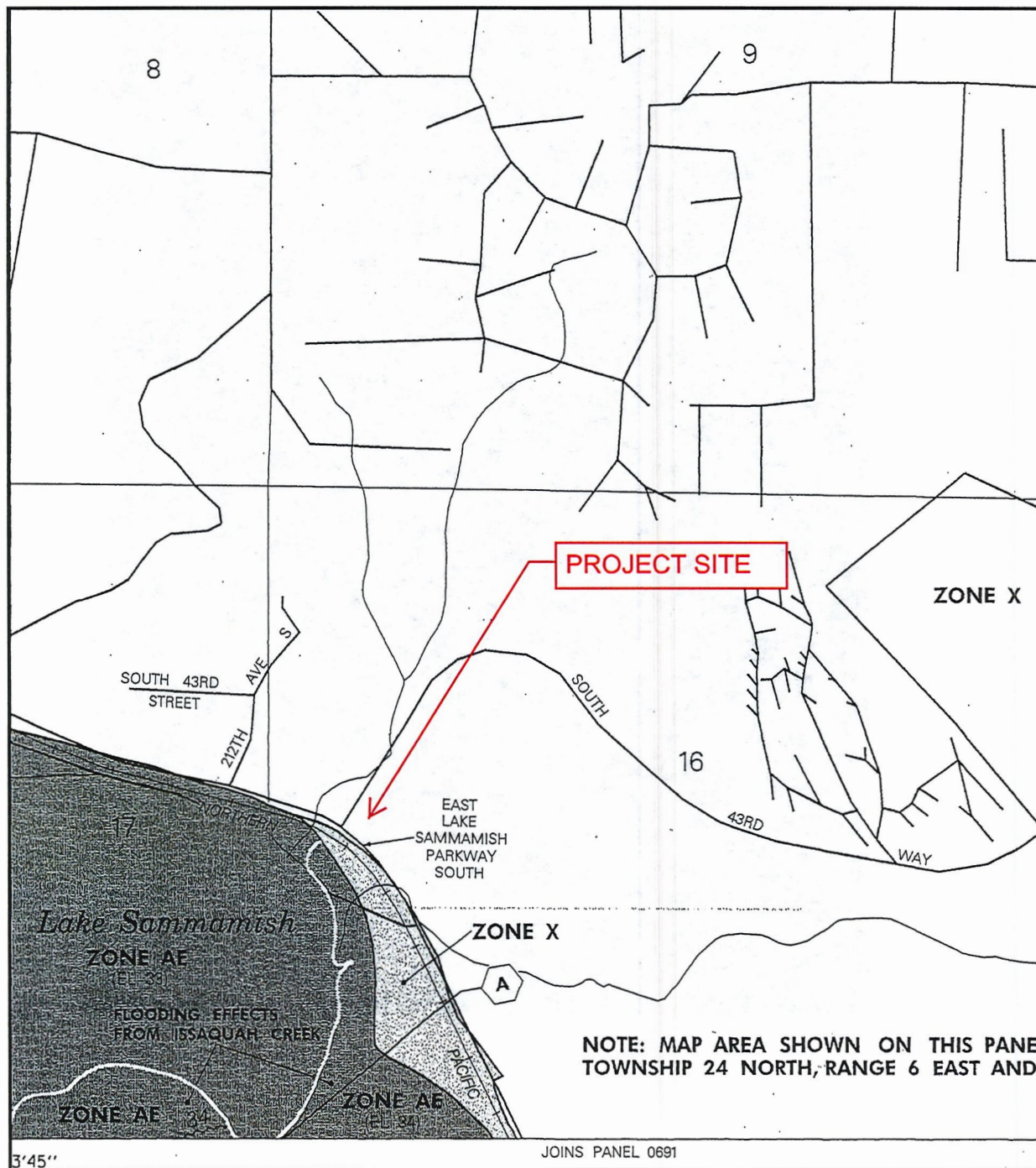
- Class 1 - 1 & 5 year Wellhead Capture Zone
- Class 2 - 10 year Wellhead Capture Zone
- Class 3 - High Aquifer Recharge Area

#### Notes:

1) CARA Class 1 and Class 2 are based on wellhead capture zones that are documented in Lower Issaquah Valley Wellhead Protection Plan (Golder Associates, 1993) and Wellhead Protection Delineation for Overdale Well (Golder Associates, 1997).

2) CARA Class 3- High Aquifer Recharge Area is based on surficial geology and soil units have high to moderate susceptibility to contamination. Sources for recharge area mapping include: Geologic Map of the Issaquah 7.5' Quadrangle (Booth and Minard, 1992) for all areas except Issaquah Highlands; Report on Geotechnical Services, Draft Environmental Impact Statement for Proposed Grand Ridge Development (Geoengineers, 1995) for Issaquah Highlands; and King County Soil Survey (U.S. Soil Conservation Service, 1973) for all areas.





APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**  
FLOOD INSURANCE RATE MAP

KING COUNTY,  
WASHINGTON AND  
INCORPORATED AREAS

PANEL 685 OF 1725  
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:  
COMMUNITY

COMMUNITY	NUMBER	PANEL	SUFFIX
KING COUNTY, UNINCORPORATED AREAS	530071	0605	F

MAP NUMBER  
53033C0685 F

MAP REVISED:  
MAY 16, 1995



Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)





United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for **King County Area, Washington**





# Preface

---

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

# Contents

---

Preface.....	2
Soil Map.....	5
Soil Map.....	6
Legend.....	7
Map Unit Legend.....	8
Map Unit Descriptions.....	8
King County Area, Washington.....	10
EvC—Everett very gravelly sandy loam, 8 to 15 percent slopes.....	10
KpB—Kitsap silt loam, 2 to 8 percent slopes.....	11
KpD—Kitsap silt loam, 15 to 30 percent slopes.....	12
Ma—Mixed alluvial land.....	13

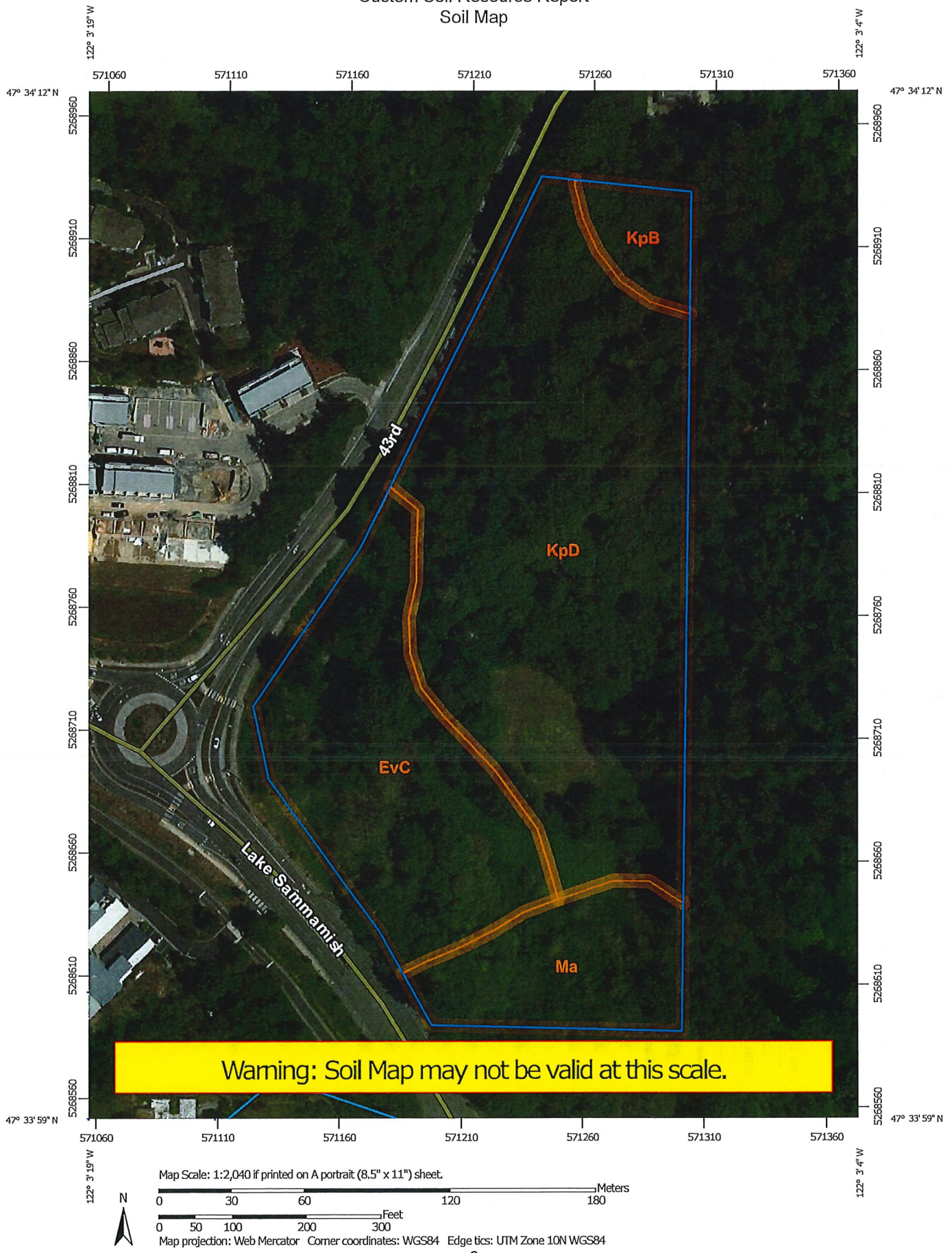
# Soil Map

---

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.




Custom Soil Resource Report  
Soil Map



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)


### Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points


### Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow


 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop


 Saline Spot


 Sandy Spot

 Severely Eroded Spot


 Sinkhole

 Slide or Slip


 Sodic Spot

 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

### Water Features


 Streams and Canals

### Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: King County Area, Washington  
Survey Area Data: Version 12, Sep 8, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2014—Jul 15, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

King County Area, Washington (WA633)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EvC	Everett very gravelly sandy loam, 8 to 15 percent slopes	2.8	26.4%
KpB	Kitsap silt loam, 2 to 8 percent slopes	0.5	4.2%
KpD	Kitsap silt loam, 15 to 30 percent slopes	6.2	57.6%
Ma	Mixed alluvial land	1.3	11.9%
Totals for Area of Interest		10.8	100.0%

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that



## Custom Soil Resource Report

have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.



## King County Area, Washington

### EvC—Everett very gravelly sandy loam, 8 to 15 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2t62b  
*Elevation:* 30 to 900 feet  
*Mean annual precipitation:* 35 to 91 inches  
*Mean annual air temperature:* 48 to 52 degrees F  
*Frost-free period:* 180 to 240 days  
*Farmland classification:* Farmland of statewide importance

#### Map Unit Composition

*Everett and similar soils:* 80 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Everett

##### Setting

*Landform:* Kames, eskers, moraines  
*Landform position (two-dimensional):* Shoulder, footslope  
*Landform position (three-dimensional):* Crest, base slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Sandy and gravelly glacial outwash

##### Typical profile

*Oi - 0 to 1 inches:* slightly decomposed plant material  
*A - 1 to 3 inches:* very gravelly sandy loam  
*Bw - 3 to 24 inches:* very gravelly sandy loam  
*C1 - 24 to 35 inches:* very gravelly loamy sand  
*C2 - 35 to 60 inches:* extremely cobbly coarse sand

##### Properties and qualities

*Slope:* 8 to 15 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water storage in profile:* Low (about 3.2 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4s  
*Hydrologic Soil Group:* A  
*Other vegetative classification:* Droughty Soils (G002XN402WA), Droughty Soils (G002XS401WA), Droughty Soils (G002XF403WA)  
*Hydric soil rating:* No

#### Minor Components

##### Alderwood

*Percent of map unit:* 10 percent

## Custom Soil Resource Report

*Landform:* Ridges, hills  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Nose slope, talf  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

### Indianola

*Percent of map unit:* 10 percent  
*Landform:* Eskers, kames, terraces  
*Landform position (three-dimensional):* Riser  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

## KpB—Kitsap silt loam, 2 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 1hmt9  
*Elevation:* 0 to 590 feet  
*Mean annual precipitation:* 37 inches  
*Mean annual air temperature:* 50 degrees F  
*Frost-free period:* 160 to 200 days  
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Kitsap and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Kitsap

#### Setting

*Landform:* Terraces  
*Parent material:* Lacustrine deposits with a minor amount of volcanic ash

#### Typical profile

*H1 - 0 to 5 inches:* silt loam  
*H2 - 5 to 24 inches:* silt loam  
*H3 - 24 to 60 inches:* stratified silt to silty clay loam

#### Properties and qualities

*Slope:* 2 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Moderately well drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 18 to 36 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water storage in profile:* High (about 11.4 inches)

## Custom Soil Resource Report

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3w

*Hydrologic Soil Group:* C

*Other vegetative classification:* Soils with Few Limitations (G002XN502WA)

*Hydric soil rating:* No

### Minor Components

#### Alderwood

*Percent of map unit:* 10 percent

*Hydric soil rating:* No

#### Bellingham

*Percent of map unit:* 3 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

#### Tukwila

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

#### Seattle

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## KpD—Kitsap silt loam, 15 to 30 percent slopes

### Map Unit Setting

*National map unit symbol:* 1hmtc

*Elevation:* 0 to 590 feet

*Mean annual precipitation:* 37 inches

*Mean annual air temperature:* 50 degrees F

*Frost-free period:* 160 to 200 days

*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Kitsap and similar soils:* 97 percent

*Minor components:* 3 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Kitsap

#### Setting

*Landform:* Terraces

*Parent material:* Lacustrine deposits with a minor amount of volcanic ash

#### Typical profile

*H1 - 0 to 5 inches:* silt loam

## Custom Soil Resource Report

*H2 - 5 to 40 inches: silt loam*

*H3 - 40 to 60 inches: stratified silt to silty clay loam*

### Properties and qualities

*Slope: 15 to 30 percent*

*Depth to restrictive feature: More than 80 inches*

*Natural drainage class: Moderately well drained*

*Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)*

*Depth to water table: About 18 to 36 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Available water storage in profile: High (about 11.4 inches)*

### Interpretive groups

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 4e*

*Hydrologic Soil Group: C*

*Other vegetative classification: Sloping to Steep Soils (G002XN702WA)*

*Hydric soil rating: No*

### Minor Components

#### Bellingham

*Percent of map unit: 1 percent*

*Landform: Depressions*

*Hydric soil rating: Yes*

#### Tukwila

*Percent of map unit: 1 percent*

*Landform: Depressions*

*Hydric soil rating: Yes*

#### Seattle

*Percent of map unit: 1 percent*

*Landform: Depressions*

*Hydric soil rating: Yes*

## Ma—Mixed alluvial land

### Map Unit Setting

*National map unit symbol: 1hmtf*

*Elevation: 0 to 590 feet*

*Mean annual precipitation: 25 to 90 inches*

*Mean annual air temperature: 46 to 54 degrees F*

*Frost-free period: 160 to 200 days*

*Farmland classification: Farmland of statewide importance*

### Map Unit Composition

*Alluvial land, mixed, and similar soils: 99 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Custom Soil Resource Report

### Description of Alluvial Land, Mixed

#### Typical profile

*H1 - 0 to 8 inches: sand*  
*H2 - 8 to 20 inches: fine sand*  
*H3 - 20 to 60 inches: sand*  
*H4 - 60 to 70 inches: loamy fine sand, gravelly sand*  
*H4 - 60 to 70 inches:*

#### Properties and qualities

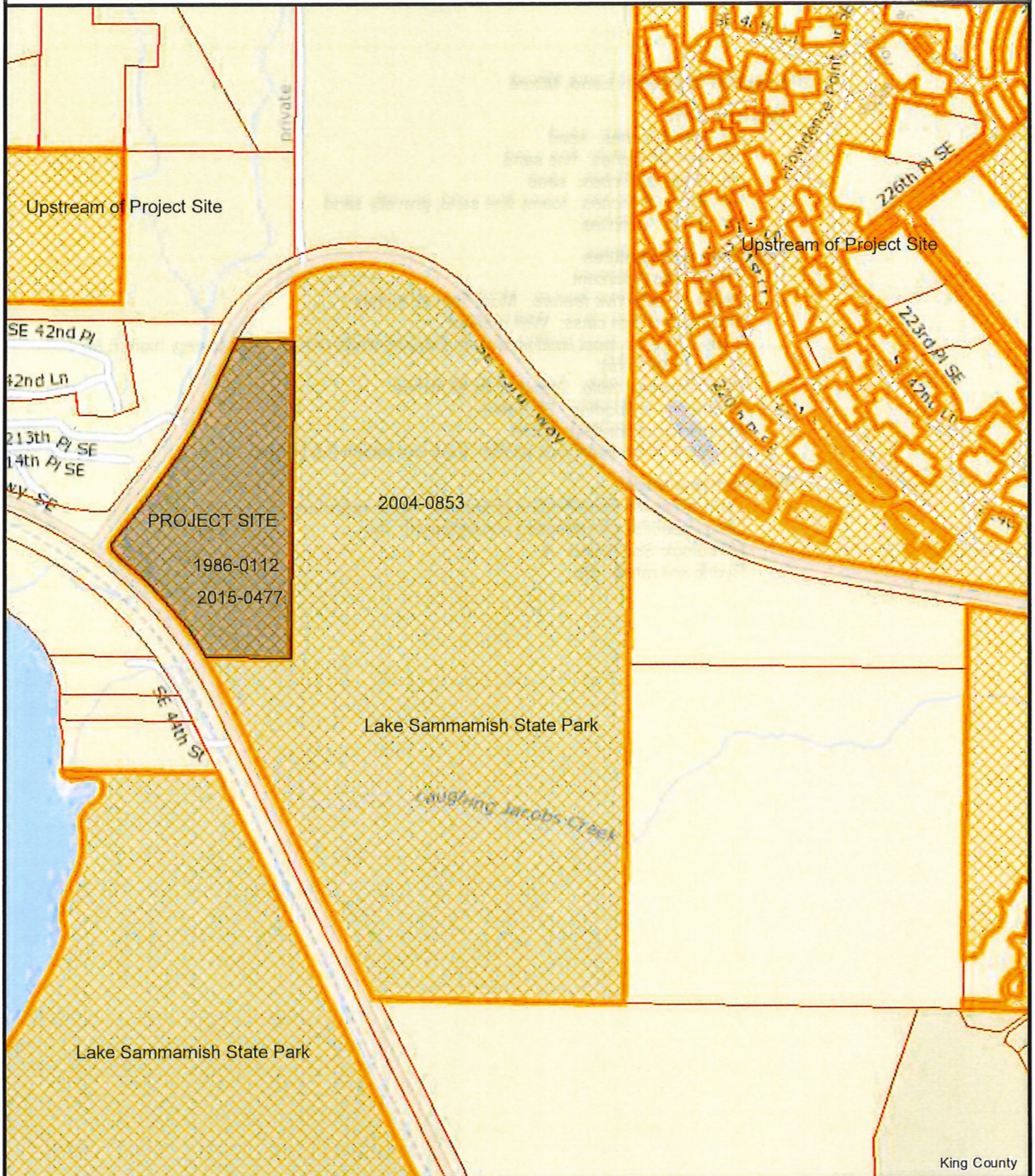
*Slope: 0 to 2 percent*  
*Depth to restrictive feature: More than 80 inches*  
*Natural drainage class: Well drained*  
*Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)*  
*Depth to water table: About 12 to 36 inches*  
*Frequency of flooding: Frequent*  
*Frequency of ponding: None*  
*Available water storage in profile: Very low (about 3.0 inches)*

#### Interpretive groups

*Land capability classification (irrigated): None specified*  
*Land capability classification (nonirrigated): 4w*  
*Hydrologic Soil Group: A*  
*Hydric soil rating: No*



# Drainage Complaints



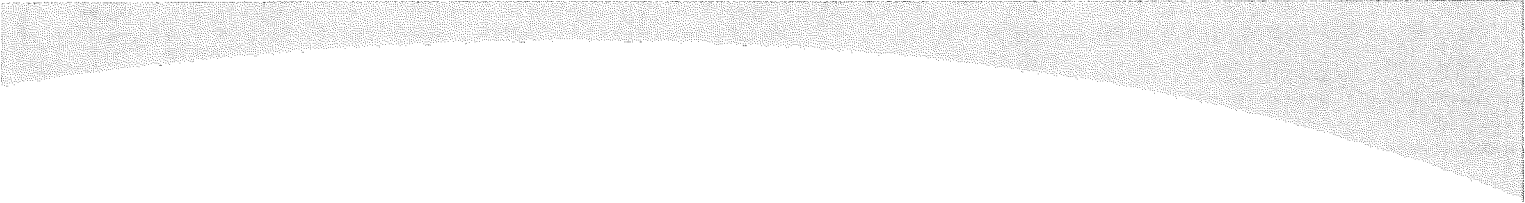
The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a survey product. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

Date: 12/13/2016

Notes:




**King County**  
**GIS CENTER**



## Appendix C

### Vault Sizing

- West Vault Summary
  - West Flow Frequency Plot
    - West Duration Plot
  - East Vault Summary
  - East Flow Frequency Plot
    - East Duration Plot
- 





## West Vault

### Retention/Detention Facility

Type of Facility: Detention Vault  
 Facility Length: 42.00 ft  
 Facility Width: 14.00 ft  
 Facility Area: 588. sq. ft  
 Effective Storage Depth: 10.00 ft  
 Stage 0 Elevation: 0.00 ft  
 Storage Volume: 5880. cu. ft  
 Riser Head: 10.00 ft  
 Riser Diameter: 12.00 inches  
 Number of orifices: 3

Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	0.38	0.013	
2	6.00	0.50	0.017	4.0
3	8.00	0.75	0.031	4.0

Top Notch Weir: None  
 Outflow Rating Curve: None

Stage (ft)	Elevation (ft)	Storage (cu. ft)	(ac-ft)	Discharge (cfs)	Percolation (cfs)
0.00	0.00	0.	0.000	0.000	0.00
0.01	0.01	6.	0.000	0.000	0.00
0.02	0.02	12.	0.000	0.001	0.00
0.03	0.03	18.	0.000	0.001	0.00
0.23	0.23	135.	0.003	0.002	0.00
0.42	0.42	247.	0.006	0.002	0.00
0.62	0.62	365.	0.008	0.003	0.00
0.82	0.82	482.	0.011	0.003	0.00
1.01	1.01	594.	0.014	0.004	0.00
1.21	1.21	712.	0.016	0.004	0.00
1.40	1.40	823.	0.019	0.005	0.00
1.60	1.60	941.	0.022	0.005	0.00
1.80	1.80	1058.	0.024	0.005	0.00
1.99	1.99	1170.	0.027	0.005	0.00
2.19	2.19	1288.	0.030	0.006	0.00
2.38	2.38	1399.	0.032	0.006	0.00
2.58	2.58	1517.	0.035	0.006	0.00
2.78	2.78	1635.	0.038	0.006	0.00
2.97	2.97	1746.	0.040	0.007	0.00
3.17	3.17	1864.	0.043	0.007	0.00
3.36	3.36	1976.	0.045	0.007	0.00
3.56	3.56	2093.	0.048	0.007	0.00
3.76	3.76	2211.	0.051	0.007	0.00
3.95	3.95	2323.	0.053	0.008	0.00
4.15	4.15	2440.	0.056	0.008	0.00
4.34	4.34	2552.	0.059	0.008	0.00
4.54	4.54	2670.	0.061	0.008	0.00
4.74	4.74	2787.	0.064	0.008	0.00

4.93	4.93	2899.	0.067	0.008	0.00
5.13	5.13	3016.	0.069	0.009	0.00
5.33	5.33	3134.	0.072	0.009	0.00
5.52	5.52	3246.	0.075	0.009	0.00
5.72	5.72	3363.	0.077	0.009	0.00
5.91	5.91	3475.	0.080	0.009	0.00
6.00	6.00	3528.	0.081	0.009	0.00
6.01	6.01	3534.	0.081	0.010	0.00
6.02	6.02	3540.	0.081	0.010	0.00
6.03	6.03	3546.	0.081	0.011	0.00
6.04	6.04	3552.	0.082	0.011	0.00
6.24	6.24	3669.	0.084	0.013	0.00
6.43	6.43	3781.	0.087	0.014	0.00
6.63	6.63	3898.	0.089	0.015	0.00
6.83	6.83	4016.	0.092	0.016	0.00
7.02	7.02	4128.	0.095	0.017	0.00
7.22	7.22	4245.	0.097	0.018	0.00
7.41	7.41	4357.	0.100	0.018	0.00
7.61	7.61	4475.	0.103	0.019	0.00
7.81	7.81	4592.	0.105	0.020	0.00
8.00	8.00	4704.	0.108	0.020	0.00
8.01	8.01	4710.	0.108	0.020	0.00
8.02	8.02	4716.	0.108	0.021	0.00
8.03	8.03	4722.	0.108	0.022	0.00
8.04	8.04	4728.	0.109	0.023	0.00
8.05	8.05	4733.	0.109	0.024	0.00
8.06	8.06	4739.	0.109	0.024	0.00
8.26	8.26	4857.	0.111	0.029	0.00
8.45	8.45	4969.	0.114	0.032	0.00
8.65	8.65	5086.	0.117	0.035	0.00
8.85	8.85	5204.	0.119	0.037	0.00
9.04	9.04	5316.	0.122	0.039	0.00
9.24	9.24	5433.	0.125	0.041	0.00
9.44	9.44	5551.	0.127	0.043	0.00
9.63	9.63	5662.	0.130	0.044	0.00
9.83	9.83	5780.	0.133	0.046	0.00
10.00	10.00	5880.	0.135	0.047	0.00
10.10	10.10	5939.	0.136	0.356	0.00
10.20	10.20	5998.	0.138	0.920	0.00
10.30	10.30	6056.	0.139	1.650	0.00
10.40	10.40	6115.	0.140	2.440	0.00
10.50	10.50	6174.	0.142	2.730	0.00
10.60	10.60	6233.	0.143	2.980	0.00
10.70	10.70	6292.	0.144	3.220	0.00
10.80	10.80	6350.	0.146	3.440	0.00
10.90	10.90	6409.	0.147	3.640	0.00
11.00	11.00	6468.	0.148	3.840	0.00
11.10	11.10	6527.	0.150	4.020	0.00
11.20	11.20	6586.	0.151	4.200	0.00
11.30	11.30	6644.	0.153	4.370	0.00
11.40	11.40	6703.	0.154	4.530	0.00
11.50	11.50	6762.	0.155	4.690	0.00
11.60	11.60	6821.	0.157	4.840	0.00
11.70	11.70	6880.	0.158	4.990	0.00

11.80	11.80	6938.	0.159	5.130	0.00
11.90	11.90	6997.	0.161	5.270	0.00

Hyd	Inflow	Outflow		Peak		Storage	
		Target	Calc	Stage	Elev	(Cu-Ft)	(Ac-Ft)
1	0.27	*****	0.26	10.07	10.07	5920.	0.136
2	0.18	0.04	0.14	10.03	10.03	5898.	0.135
3	0.15	*****	0.14	10.03	10.03	5898.	0.135
4	0.10	*****	0.04	9.31	9.31	5472.	0.126
5	0.11	*****	0.04	9.02	9.02	5304.	0.122
6	0.09	0.01	0.02	7.97	7.97	4684.	0.108
7	0.20	*****	0.02	6.96	6.96	4094.	0.094
8	0.10	*****	0.01	4.73	4.73	2782.	0.064

#### Route Time Series through Facility

Inflow Time Series File:16066\_devwest.tsf

Outflow Time Series File:West\_Out

#### Inflow/Outflow Analysis

Peak Inflow Discharge: 0.267 CFS at 7:00 on Jan 9 in Year 8  
Peak Outflow Discharge: 0.256 CFS at 7:00 on Jan 9 in Year 8  
Peak Reservoir Stage: 10.07 Ft  
Peak Reservoir Elev: 10.07 Ft  
Peak Reservoir Storage: 5920. Cu-Ft  
: 0.136 Ac-Ft

#### Flow Frequency Analysis

Time Series File:west\_out.tsf

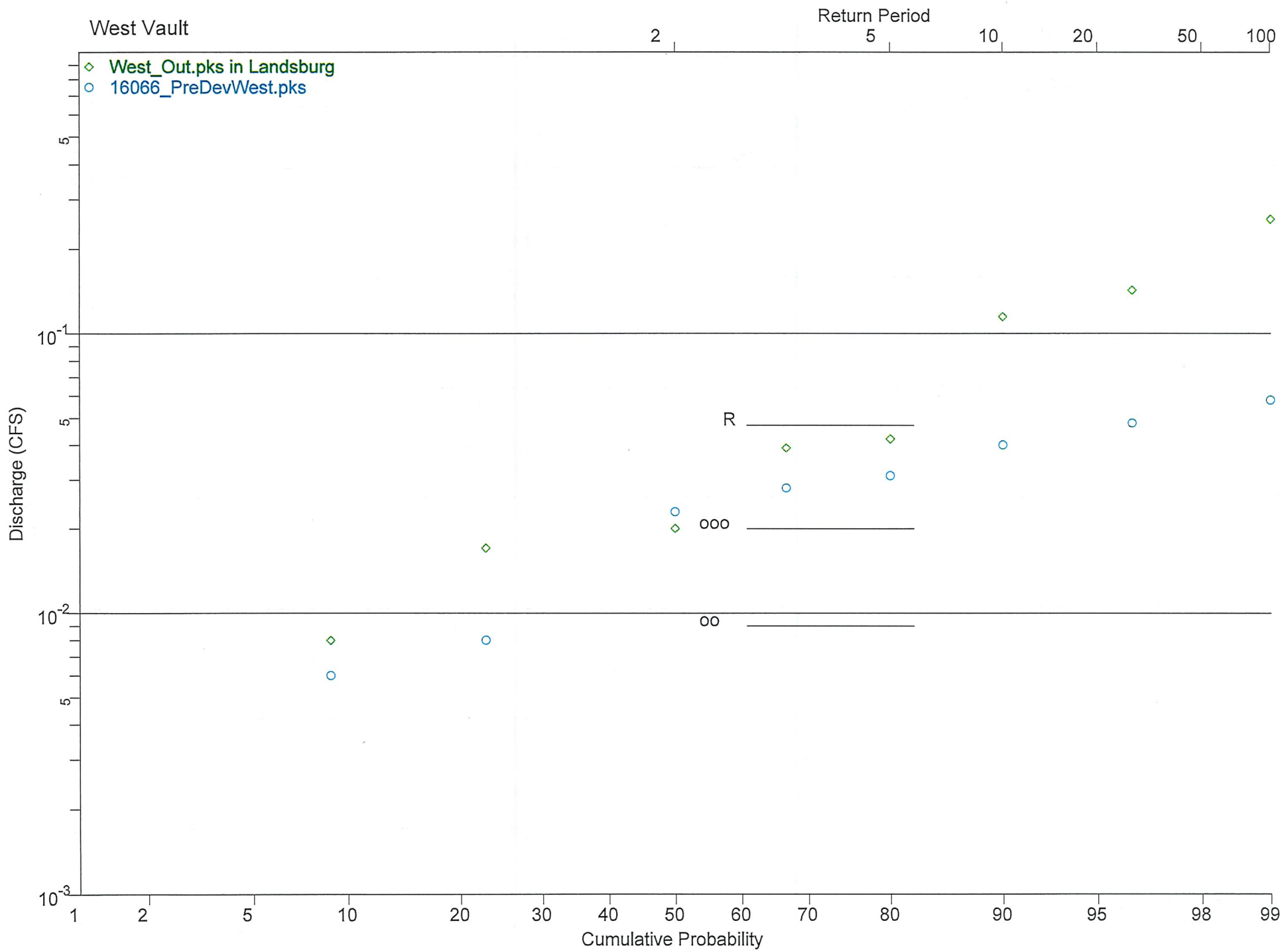
Project Location:Landsburg

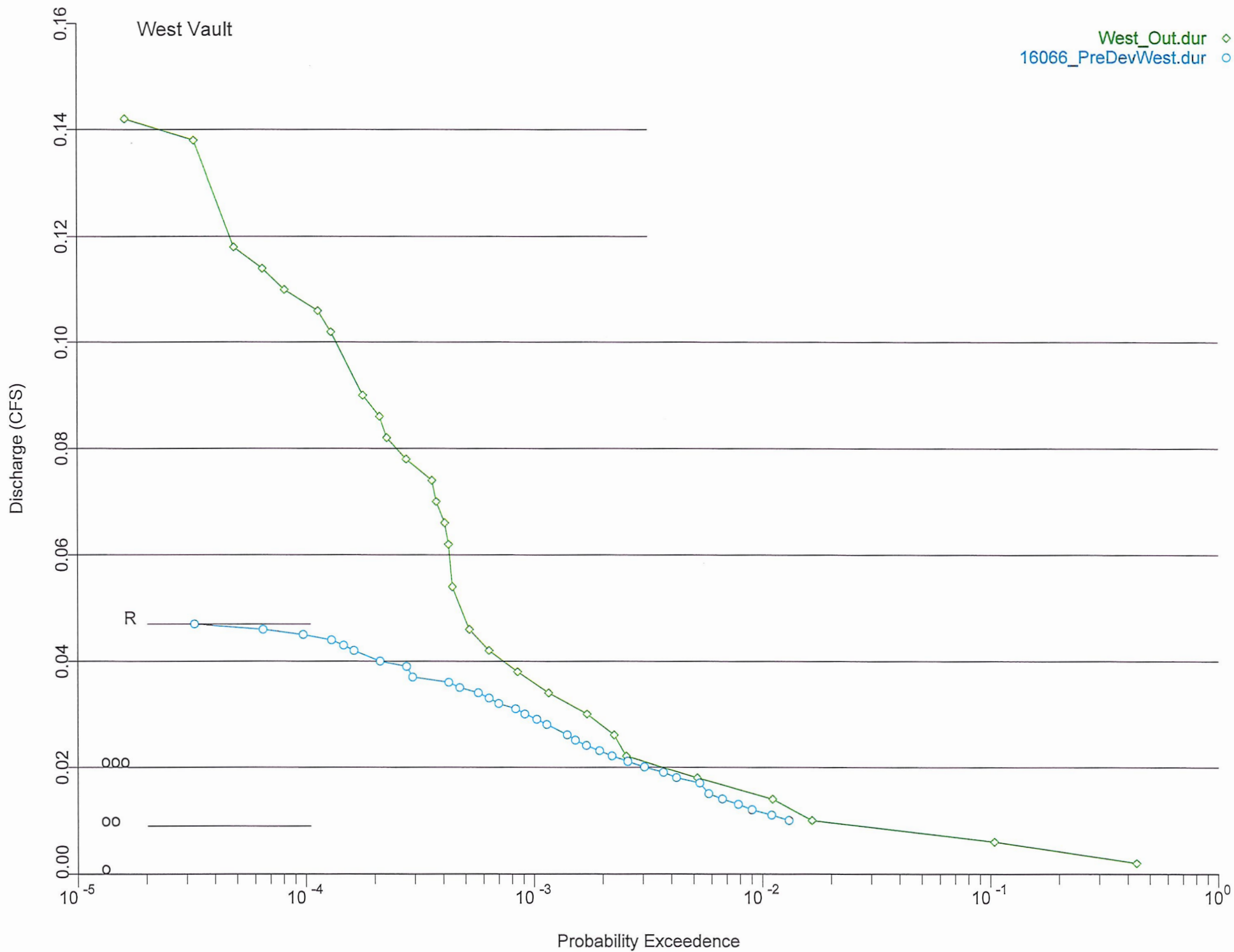
---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----			
Flow Rate (CFS)	Rank	Time of Peak		Peaks (CFS)	Rank (ft)	Return Period	Prob
0.115	3	2/09/01	15:00	0.256	10.07	1	100.00
0.008	8	11/05/01	3:00	0.143	10.03	2	25.00
0.039	5	2/28/03	18:00	0.115	10.02	3	10.00
0.017	7	8/26/04	6:00	0.042	9.31	4	5.00
0.042	4	1/05/05	12:00	0.039	9.03	5	3.00
0.020	6	1/19/06	1:00	0.020	7.97	6	2.00
0.143	2	11/23/06	21:00	0.017	6.96	7	1.30
0.256	1	1/09/08	7:00	0.008	4.73	8	1.10
Computed Peaks				0.218	10.06		50.00

#### Flow Duration from Time Series File:west\_out.tsf

Cutoff CFS	Count	Frequency %	CDF %	Exceedence %	Probability
0.002	34548	56.341	56.341	43.659	0.437E+00
0.006	20398	33.265	89.605	10.395	0.104E+00
0.010	5365	8.749	98.355	1.645	0.165E-01
0.014	328	0.535	98.889	1.111	0.111E-01
0.018	362	0.590	99.480	0.520	0.520E-02
0.022	163	0.266	99.746	0.254	0.254E-02
0.026	18	0.029	99.775	0.225	0.225E-02

0.030	33	0.054	99.829	0.171	0.171E-02
0.034	34	0.055	99.884	0.116	0.116E-02
0.038	19	0.031	99.915	0.085	0.848E-03
0.042	13	0.021	99.936	0.064	0.636E-03
0.046	7	0.011	99.948	0.052	0.522E-03
0.050	5	0.008	99.956	0.044	0.440E-03
0.054	0	0.000	99.956	0.044	0.440E-03
0.058	1	0.002	99.958	0.042	0.424E-03
0.062	0	0.000	99.958	0.042	0.424E-03
0.066	1	0.002	99.959	0.041	0.408E-03
0.070	2	0.003	99.962	0.038	0.375E-03
0.074	1	0.002	99.964	0.036	0.359E-03
0.078	5	0.008	99.972	0.028	0.277E-03
0.082	3	0.005	99.977	0.023	0.228E-03
0.086	1	0.002	99.979	0.021	0.212E-03
0.090	2	0.003	99.982	0.018	0.179E-03
0.094	3	0.005	99.987	0.013	0.130E-03
0.098	0	0.000	99.987	0.013	0.130E-03
0.102	0	0.000	99.987	0.013	0.130E-03
0.106	1	0.002	99.989	0.011	0.114E-03
0.110	2	0.003	99.992	0.008	0.815E-04
0.114	1	0.002	99.993	0.007	0.652E-04
0.118	1	0.002	99.995	0.005	0.489E-04
0.122	1	0.002	99.997	0.003	0.326E-04
0.126	0	0.000	99.997	0.003	0.326E-04
0.130	0	0.000	99.997	0.003	0.326E-04
0.134	0	0.000	99.997	0.003	0.326E-04
0.138	0	0.000	99.997	0.003	0.326E-04
0.142	1	0.002	99.998	0.002	0.163E-04





## East Vault

### Retention/Detention Facility

Type of Facility: Detention Vault  
 Facility Length: 126.49 ft  
 Facility Width: 63.25 ft  
 Facility Area: 8000. sq. ft  
 Effective Storage Depth: 10.00 ft  
 Stage 0 Elevation: 66.50 ft  
 Storage Volume: 80000. cu. ft  
 Riser Head: 10.00 ft  
 Riser Diameter: 12.00 inches  
 Number of orifices: 3

Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	1.13	0.109	
2	6.00	1.25	0.085	4.0
3	8.00	1.25	0.060	4.0

Top Notch Weir: None  
 Outflow Rating Curve: None

Stage (ft)	Elevation (ft)	Storage (cu. ft)	(ac-ft)	Discharge (cfs)	Percolation (cfs)
0.00	66.50	0.	0.000	0.000	0.00
0.01	66.51	80.	0.002	0.004	0.00
0.02	66.52	160.	0.004	0.005	0.00
0.04	66.54	320.	0.007	0.006	0.00
0.05	66.55	400.	0.009	0.007	0.00
0.06	66.56	480.	0.011	0.008	0.00
0.07	66.57	560.	0.013	0.009	0.00
0.08	66.58	640.	0.015	0.010	0.00
0.09	66.59	720.	0.017	0.011	0.00
0.29	66.79	2320.	0.053	0.018	0.00
0.49	66.99	3920.	0.090	0.024	0.00
0.68	67.18	5440.	0.125	0.028	0.00
0.88	67.38	7040.	0.162	0.032	0.00
1.07	67.57	8560.	0.197	0.036	0.00
1.27	67.77	10160.	0.233	0.039	0.00
1.47	67.97	11760.	0.270	0.042	0.00
1.66	68.16	13280.	0.305	0.044	0.00
1.86	68.36	14880.	0.342	0.047	0.00
2.05	68.55	16400.	0.376	0.049	0.00
2.25	68.75	18000.	0.413	0.052	0.00
2.45	68.95	19600.	0.450	0.054	0.00
2.64	69.14	21120.	0.485	0.056	0.00
2.84	69.34	22720.	0.522	0.058	0.00
3.03	69.53	24240.	0.556	0.060	0.00
3.23	69.73	25840.	0.593	0.062	0.00
3.43	69.93	27440.	0.630	0.064	0.00
3.62	70.12	28960.	0.665	0.065	0.00
3.82	70.32	30560.	0.702	0.067	0.00

4.02	70.52	32160.	0.738	0.069	0.00
4.21	70.71	33680.	0.773	0.070	0.00
4.41	70.91	35280.	0.810	0.072	0.00
4.60	71.10	36800.	0.845	0.074	0.00
4.80	71.30	38400.	0.882	0.075	0.00
5.00	71.50	40000.	0.918	0.077	0.00
5.19	71.69	41520.	0.953	0.078	0.00
5.39	71.89	43120.	0.990	0.080	0.00
5.58	72.08	44640.	1.025	0.081	0.00
5.78	72.28	46240.	1.062	0.083	0.00
5.98	72.48	47840.	1.098	0.084	0.00
6.00	72.50	48000.	1.102	0.084	0.00
6.01	72.51	48080.	1.104	0.084	0.00
6.03	72.53	48240.	1.107	0.086	0.00
6.04	72.54	48320.	1.109	0.087	0.00
6.05	72.55	48400.	1.111	0.090	0.00
6.07	72.57	48560.	1.115	0.093	0.00
6.08	72.58	48640.	1.117	0.096	0.00
6.09	72.59	48720.	1.118	0.098	0.00
6.10	72.60	48800.	1.120	0.098	0.00
6.30	72.80	50400.	1.157	0.109	0.00
6.50	73.00	52000.	1.194	0.117	0.00
6.69	73.19	53520.	1.229	0.124	0.00
6.89	73.39	55120.	1.265	0.130	0.00
7.08	73.58	56640.	1.300	0.136	0.00
7.28	73.78	58240.	1.337	0.141	0.00
7.48	73.98	59840.	1.374	0.145	0.00
7.67	74.17	61360.	1.409	0.150	0.00
7.87	74.37	62960.	1.445	0.154	0.00
8.00	74.50	64000.	1.469	0.157	0.00
8.01	74.51	64080.	1.471	0.158	0.00
8.03	74.53	64240.	1.475	0.159	0.00
8.04	74.54	64320.	1.477	0.161	0.00
8.05	74.55	64400.	1.478	0.163	0.00
8.07	74.57	64560.	1.482	0.166	0.00
8.08	74.58	64640.	1.484	0.170	0.00
8.09	74.59	64720.	1.486	0.172	0.00
8.10	74.60	64800.	1.488	0.173	0.00
8.12	74.62	64960.	1.491	0.174	0.00
8.31	74.81	66480.	1.526	0.187	0.00
8.51	75.01	68080.	1.563	0.198	0.00
8.71	75.21	69680.	1.600	0.207	0.00
8.90	75.40	71200.	1.635	0.215	0.00
9.10	75.60	72800.	1.671	0.223	0.00
9.29	75.79	74320.	1.706	0.230	0.00
9.49	75.99	75920.	1.743	0.237	0.00
9.69	76.19	77520.	1.780	0.243	0.00
9.88	76.38	79040.	1.815	0.250	0.00
10.00	76.50	80000.	1.837	0.253	0.00
10.10	76.60	80800.	1.855	0.564	0.00
10.20	76.70	81600.	1.873	1.130	0.00
10.30	76.80	82400.	1.892	1.860	0.00
10.40	76.90	83200.	1.910	2.660	0.00
10.50	77.00	84000.	1.928	2.940	0.00



10.60	77.10	84800.	1.947	3.200	0.00
10.70	77.20	85600.	1.965	3.440	0.00
10.80	77.30	86400.	1.983	3.660	0.00
10.90	77.40	87200.	2.002	3.870	0.00
11.00	77.50	88000.	2.020	4.060	0.00
11.10	77.60	88800.	2.039	4.250	0.00
11.20	77.70	89600.	2.057	4.430	0.00
11.30	77.80	90400.	2.075	4.600	0.00
11.40	77.90	91200.	2.094	4.770	0.00
11.50	78.00	92000.	2.112	4.930	0.00
11.60	78.10	92800.	2.130	5.080	0.00
11.70	78.20	93600.	2.149	5.230	0.00
11.80	78.30	94400.	2.167	5.380	0.00

Hyd	Inflow	Outflow	Peak		Storage	
			Stage	Elev	(Cu-Ft)	(Ac-Ft)
1	2.01	1.54	10.26	76.76	82052.	1.884
2	1.33	0.24	9.65	76.15	77230.	1.773
3	1.10	0.23	9.28	75.78	74261.	1.705
4	0.66	0.14	7.40	73.90	59179.	1.359
5	0.76	0.14	7.10	73.60	56767.	1.303
6	0.63	0.07	4.41	70.91	35246.	0.809
7	1.28	0.06	3.38	69.88	27050.	0.621
8	0.53	0.06	2.70	69.20	21630.	0.497

Hyd	R/D Facility	Tributary	Reservoir	POC Outflow	
	Outflow	Inflow	Inflow	Target	Calc
1	1.54	0.26	*****	*****	1.73
2	0.24	0.14	*****	0.45	0.34
3	0.23	0.11	*****	*****	0.31
4	0.14	0.04	*****	*****	0.17
5	0.14	0.04	*****	*****	0.17
6	0.07	0.02	*****	0.21	0.09
7	0.06	0.02	*****	*****	0.08
8	0.06	0.01	*****	*****	0.06

-----

Route Time Series through Facility

Inflow Time Series File:16066\_deveast.tsf

Outflow Time Series File:East\_Out

POC Time Series File:DSout

Inflow/Outflow Analysis

Peak Inflow Discharge: 2.01 CFS at 7:00 on Jan 9 in Year 8  
Peak Outflow Discharge: 1.54 CFS at 9:00 on Jan 9 in Year 8  
Peak Reservoir Stage: 10.26 Ft  
Peak Reservoir Elev: 76.76 Ft  
Peak Reservoir Storage: 82052. Cu-Ft  
: 1.884 Ac-Ft

Add Time Series:west\_out.tsf

Peak Summed Discharge: 1.73 CFS at 9:00 on Jan 9 in Year 8

Point of Compliance File:DSout.tsf

Flow Frequency Analysis

Time Series File: east\_out.tsf  
Project Location: Landsburg

---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----				
Flow Rate (CFS)	Rank	Time of Peak		- - Peaks - - (CFS)	Rank (ft)	Return Period	Prob	
0.237	3	2/09/01	21:00	1.54	10.26	1	100.00	0.990
0.057	8	1/07/02	2:00	0.242	9.67	2	25.00	0.960
0.138	5	3/07/03	0:00	0.237	9.51	3	10.00	0.900
0.064	7	8/26/04	8:00	0.143	7.40	4	5.00	0.800
0.143	4	1/08/05	7:00	0.138	7.16	5	3.00	0.667
0.079	6	10/28/05	4:00	0.079	5.25	6	2.00	0.500
0.242	2	11/24/06	9:00	0.064	3.38	7	1.30	0.231
1.54	1	1/09/08	9:00	0.057	2.72	8	1.10	0.091
Computed Peaks				1.11	10.20		50.00	0.980
Flow Frequency Analysis								
Time Series File: dsout.tsf								
Project Location: Landsburg								

---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----				
Flow Rate (CFS)	Rank	Time of Peak		- - Peaks - - (CFS)	Rank	Return Period	Prob	
0.318	3	2/09/01	18:00	1.72	1	100.00		0.990
0.065	8	1/07/02	0:00	0.337	2	25.00		0.960
0.170	5	3/06/03	22:00	0.318	3	10.00		0.900
0.080	7	8/26/04	6:00	0.174	4	5.00		0.800
0.174	4	1/08/05	6:00	0.170	5	3.00		0.667
0.098	6	10/28/05	2:00	0.098	6	2.00		0.500
0.337	2	11/24/06	5:00	0.080	7	1.30		0.231
1.72	1	1/09/08	9:00	0.065	8	1.10		0.091
Computed Peaks				1.26		50.00		0.980

Flow Duration from Time Series File: east_out.tsf					
Cutoff CFS	Count	Frequency %	CDF %	Exceedence_Probability %	
0.003	22234	36.259	36.259	63.741	0.637E+00
0.010	5383	8.779	45.038	54.962	0.550E+00
0.017	6414	10.460	55.497	44.503	0.445E+00
0.024	5874	9.579	65.077	34.923	0.349E+00
0.031	5477	8.932	74.008	25.992	0.260E+00
0.037	4473	7.295	81.303	18.697	0.187E+00
0.044	3636	5.930	87.233	12.767	0.128E+00
0.051	2660	4.338	91.570	8.430	0.843E-01
0.058	1544	2.518	94.088	5.912	0.591E-01
0.065	1074	1.751	95.840	4.160	0.416E-01
0.071	982	1.601	97.441	2.559	0.256E-01
0.078	692	1.129	98.570	1.430	0.143E-01
0.085	388	0.633	99.203	0.797	0.797E-02
0.092	17	0.028	99.230	0.770	0.770E-02
0.099	20	0.033	99.263	0.737	0.737E-02
0.105	35	0.057	99.320	0.680	0.680E-02
0.112	51	0.083	99.403	0.597	0.597E-02
0.119	59	0.096	99.499	0.501	0.501E-02
0.126	69	0.113	99.612	0.388	0.388E-02

0.133	29	0.047	99.659	0.341	0.341E-02
0.139	37	0.060	99.720	0.280	0.280E-02
0.146	40	0.065	99.785	0.215	0.215E-02
0.153	14	0.023	99.808	0.192	0.192E-02
0.160	18	0.029	99.837	0.163	0.163E-02
0.167	3	0.005	99.842	0.158	0.158E-02
0.173	1	0.002	99.843	0.157	0.157E-02
0.180	5	0.008	99.852	0.148	0.148E-02
0.187	5	0.008	99.860	0.140	0.140E-02
0.194	6	0.010	99.870	0.130	0.130E-02
0.200	7	0.011	99.881	0.119	0.119E-02
0.207	9	0.015	99.896	0.104	0.104E-02
0.214	8	0.013	99.909	0.091	0.913E-03
0.221	14	0.023	99.932	0.068	0.685E-03
0.228	14	0.023	99.954	0.046	0.457E-03
0.234	12	0.020	99.974	0.026	0.261E-03
0.241	13	0.021	99.995	0.005	0.489E-04

Flow Duration from Time Series File:dsout.tsf

Cutoff	Count	Frequency	CDF	Exceedence	Probability
CFS		%	%	%	
0.005	22906	37.355	37.355	62.645	0.626E+00
0.014	7154	11.667	49.022	50.978	0.510E+00
0.024	7798	12.717	61.738	38.262	0.383E+00
0.033	6513	10.621	72.360	27.640	0.276E+00
0.043	5747	9.372	81.732	18.268	0.183E+00
0.052	4190	6.833	88.565	11.435	0.114E+00
0.062	2746	4.478	93.043	6.957	0.696E-01
0.071	1463	2.386	95.429	4.571	0.457E-01
0.081	1190	1.941	97.370	2.630	0.263E-01
0.090	765	1.248	98.617	1.383	0.138E-01
0.100	269	0.439	99.056	0.944	0.944E-02
0.109	92	0.150	99.206	0.794	0.794E-02
0.118	63	0.103	99.309	0.691	0.691E-02
0.128	67	0.109	99.418	0.582	0.582E-02
0.137	56	0.091	99.509	0.491	0.491E-02
0.147	79	0.129	99.638	0.362	0.362E-02
0.156	61	0.099	99.737	0.263	0.263E-02
0.166	23	0.038	99.775	0.225	0.225E-02
0.175	28	0.046	99.821	0.179	0.179E-02
0.185	1	0.002	99.822	0.178	0.178E-02
0.194	5	0.008	99.830	0.170	0.170E-02
0.204	6	0.010	99.840	0.160	0.160E-02
0.213	8	0.013	99.853	0.147	0.147E-02
0.223	9	0.015	99.868	0.132	0.132E-02
0.232	12	0.020	99.887	0.113	0.113E-02
0.241	15	0.024	99.912	0.088	0.881E-03
0.251	6	0.010	99.922	0.078	0.783E-03
0.260	9	0.015	99.936	0.064	0.636E-03
0.270	7	0.011	99.948	0.052	0.522E-03
0.279	8	0.013	99.961	0.039	0.391E-03
0.289	12	0.020	99.980	0.020	0.196E-03
0.298	4	0.007	99.987	0.013	0.130E-03
0.308	3	0.005	99.992	0.008	0.815E-04

0.317	2	0.003	99.995	0.005	0.489E-04
0.327	2	0.003	99.998	0.002	0.163E-04
0.336	0	0.000	99.998	0.002	0.163E-04

East Vault

Return Period

2

5

10

20

50

100

◇ East\_Out.pks in Landsburg

◆ DSout.pks

Discharge (CFS)

10<sup>1</sup>

5

10<sup>0</sup>

5

10<sup>-1</sup>

5

10<sup>-2</sup>

Cumulative Probability

1

2

5

10

20

30

40

50

60

70

80

90

95

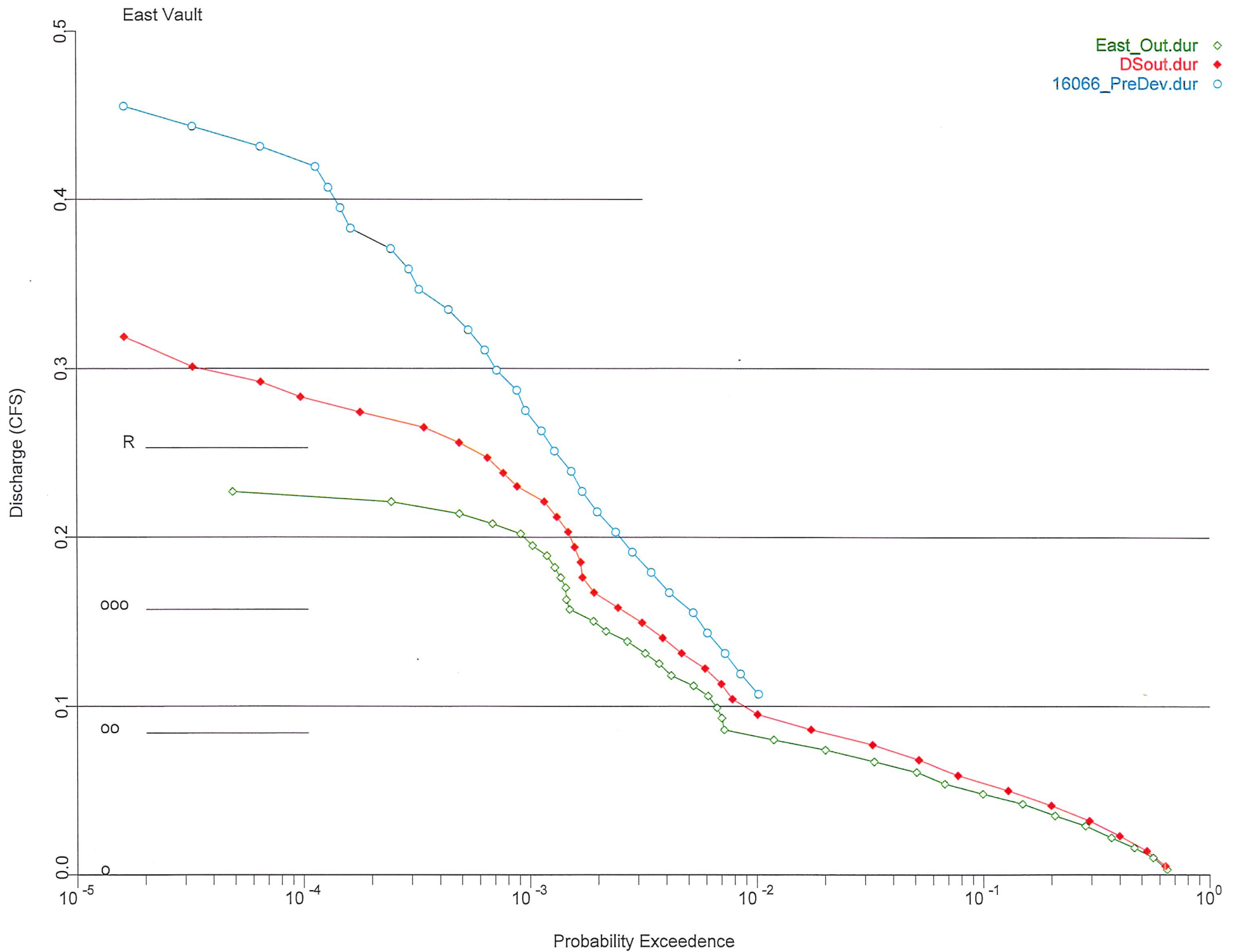
98

99

R

ooo

oo

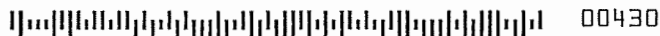




P.O. Box 50046  
Los Angeles CA 90074

(888) 499-6378  
IRS#: 68-0135207

## INVOICE



CITY OF ISSAQUAH  
PO Box 1307  
Stephanie Johnson  
Issaquah WA 98027-0051

CHECK CREDIT CARD USING FOR PAYMENT AND FILL OUT BELOW.			
<input type="checkbox"/> MasterCard	<input type="checkbox"/> VISA	<input type="checkbox"/> Discover	<input type="checkbox"/> AMERICAN EXPRESS
CARD NUMBER		AMOUNT	
NAME ON CARD (PLEASE PRINT)		EXP. DATE	
SIGNATURE			
INVOICE DATE 09/15/2017	DUE DATE 10/15/2017	ACCOUNT # 001451	PAY THIS AMOUNT \$319.00

Invoice Number: 0744984-WA

7017

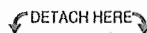


00430

AMOUNT PA

USHWWAH1-0562792-0000000-6508516-001-000195-#000530-7017

PLEASE CHECK BOX IF ABOVE ADDRESS IS INCORRECT AND INDICATE CHANGES ON BACK.



AND RETURN THIS TOP PORTION WITH YOUR PAYMENT  
USING THE RETURN ENVELOPE ENCLOSED

SVC DATE	PATIENT NAME	SOC SEC #	CASE #	SERVICE DESCRIPTION	CHARGE
09/07/2017	BOYLE, DAVID	XXX-XX-0000	682-226147	PE-DOT CITY OF ISSAQUAH Facility - Bellevue	\$99.00
09/07/2017	CHEN, TONG SHENG 00150501 / 549000	XXX-XX-0000	693-317417	EVAL-PAT/INSPECTOR CITY OF ISSAQUAH, INSPECTOR Facility - Southcenter	\$94.00
09/07/2017	SMOUT, HEATHER	XXX-XX-0000	682-226149	EVAL-PAT/PARKS & FACILITIES MA CITY OF ISSAQUAH Facility - Bellevue	\$126.00

Pay Online at [www.ushealthworks.com/BillingServices](http://www.ushealthworks.com/BillingServices)  
Send Billing Questions to [billing.questions@ushworks.com](mailto:billing.questions@ushworks.com)

### DOWNLOAD OUR MOBILE APP

Visit your favorite app store today to download the U.S. HealthWorks app that  
includes a helpful VISIT NOW form for when you need healthcare services!

Contact U.S. HealthWorks Medical Group today to schedule a FLU CLINIC at your work site.  
Get your employees vaccinated to protect your company's productivity.  
Go to [www.ushealthworks.com](http://www.ushealthworks.com) for the U.S. HealthWorks Medical Group nearest you.

### PLEASE HELP US GO GREEN!

Visit [www.ushealthworks.com/BillingServices](http://www.ushealthworks.com/BillingServices) and register to receive your future  
physical and drug screen invoices via email!  
Code ID: USHWWAH1  
Access#: 6508516-1-195

If an item is not paid in full, please indicate disputed items on the reverse side of this form and return in the enclosed envelope.

Payment Terms: Unpaid balances after 30 days from the date of this invoice are subject to a 1.5% finance charge per month. **BALANCE DUE: \$319.00**

Invoice Number: 0744984-WA Invoice Date: 09/15/2017 Account Number: 001451 Due Date: 10/15/2017

EMPLOYER:  
CITY OF ISSAQUAH  
PO BOX 1307  
STEPHANIE JOHNSON  
ISSAQUAH WA 980271307

PAYOR:  
CITY OF ISSAQUAH  
PO Box 1307  
Stephanie Johnson  
Issaquah WA 98027-0051

